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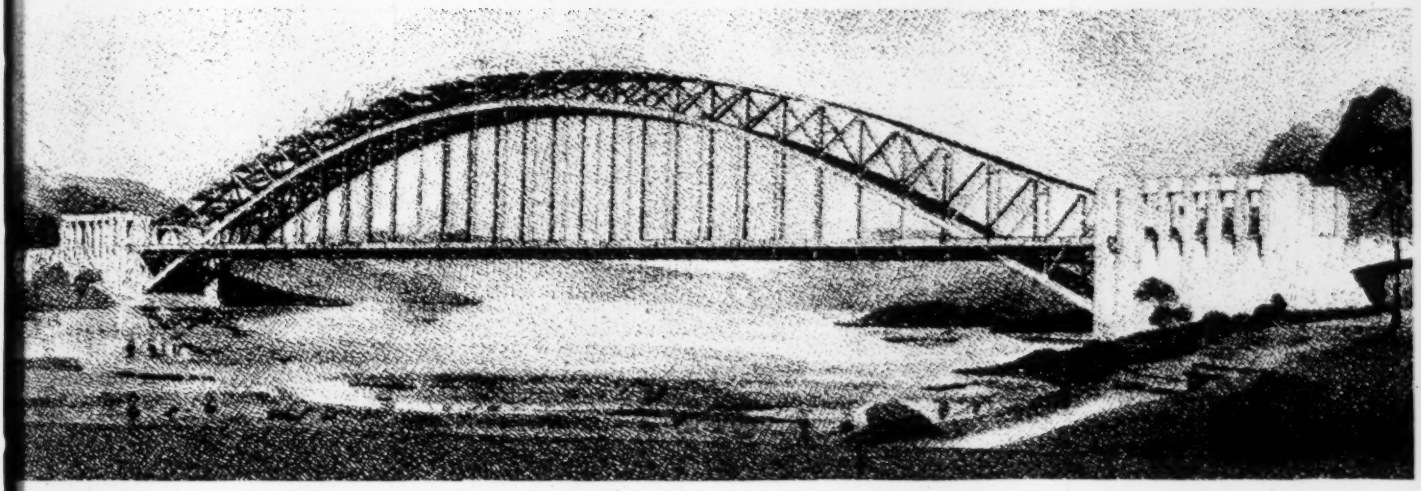

New Croton Lake crossing for Westchester County parkway
is a three-hinged arch of mighty long span

Model research for Mississippi flood problems - - - - by Herbert D. Vogel
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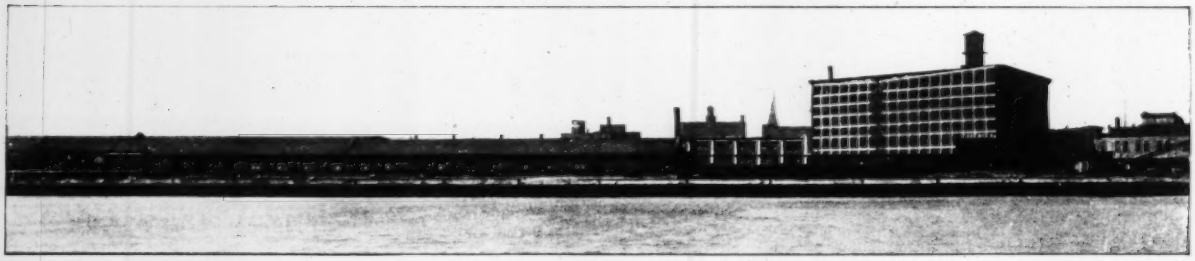
Report of civil engineers meeting in Tacoma

Status of State Wage Rate Legislation

. . . A telegraphic survey



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Lackawanna Deep-Arch Piling Section DP 166 was used in constructing the 1440-foot dock shown above. The design is of the familiar type, consisting of a wall of Lackawanna Steel Sheet Piling tied to a timber anchorage by means of steel tie-rods. The depth of water at the face of the dock was increased by dredging to 22 feet below mean-lake level; the top of the dock is eight feet above the water level.

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F. E. Schmitt, Editor

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Move Material Promptly

AN UNEXPECTED item in the latest report of Hoover Dam progress is that some of the plant construction was held up by delay in delivery of materials. In these days of a buyer's market, with materials and labor overplentiful and anxiously seeking a market, it is strange to hear of work delayed by slowness in getting the material. Very likely the happening was natural in this case, as plans and specifications for all Hoover Dam plant are being hurried through to construction so fast that work on the ground may get ahead of even rapid material deliveries. Yet it is a pertinent reminder of the need for prompt and well-managed stocking and shipment of material if the best possibilities of pushing construction ahead are to be realized. There are many other and unavoidable elements of delay to construction—such as the complications created by new wage-rate laws—and it is of first importance to avoid any needless delays. If our systems of distribution and stocking are efficient, materials ought to be available with utmost promptness wherever work calls for them.

Bad Work Rebuked

AFTER a year's time the false accusation concerning payment for the San Gabriel dam excavation again comes to notice, through the state registration board's censure of the engineer who made the survey on which the accusation was based. It will be recalled that his survey was later shown to be absurdly wrong, by a careful investigation and resurvey made by an engineering commission appointed by the county grand jury. In view of this fact the board of registration prepared to entertain charges of incompetence against the surveyor and, after waiting vainly for the filing of such charges, took the initiative and instituted hearings. As outlined in this issue, it found that the surveyor was guilty of gross negligence and had acted in utter disregard for the reputation and professional integrity of a brother engineer, but it did not revoke his license because the facts did not conclusively establish incompetence—the only punishment and cause for punishment recognized by the registration act as then in force. The decision is gratifying. It will give strong support to engineering soundness and integrity everywhere, but particularly in California. At the same time it is welcome as a further step in rectifying the injustice done by the ugly fraud charges against E. C. Eaton and the flood district officials. However, the regrettable fact remains that the false accusers and those actively behind the accusation have not been brought to light or punished. Since the board has gone as far as its powers permit, further steps must come from local engineering circles, which have made no outward move in the case for twelve months. The whole incident also points to defects in the original California registration act: "gross incompetence" is hard to prove, and revocation of license is sometimes too severe a penalty for misdeeds that deserve punishment. As recently amended the act broadens the charges and provides for suspension of license, a strong disciplinary measure. The importance of effective provision for enforcement is clearly evident from the present incident. Vigilance also is clearly essential, and in this respect the California board has made a strong beginning.

Misleading Statements

ALL is not clear in the matter of the Golden Gate Bridge project, recent developments indicate. Only one bid for the bonds was received, and this was so conditioned as to be unacceptable. In addition, the difference of opinion on the adequacy of the south pier foundation remains an unsettling element. Unfortunately this point has been involved in some confusing happenings. Erroneous statements were published in local newspapers just after the construction bids were opened, to the effect that the proposed foundation had been examined and approved by the well-known engineering firm of Moran & Proctor. These statements, which were quite contrary to fact, may have originated in the misunderstanding and zeal of reporters or rewrite men, but prompt correction would seem to have been essential, to the end that the public might not be misled. But although the engineers mentioned brought the facts to the knowledge of the papers and of the manager of the bridge district, no correction was published. This is a regrettable omission. We know nothing of the adequacy of the rock on which it is proposed to found the south pier, but it would seem that a great public improvement should be kept scrupulously clear of misleading public statements, regardless of their origin.

Large-Scale Structural Models

THE degree to which study of structural framework by means of models has been accepted by structural engineers is strikingly evident in the decision to use this means of stress and deflection determination for several proposed designs of the San Francisco-Oakland bridge. In a measure the outlined program of study constitutes a test of structural model analysis itself, for no models approaching in size those to be built for this program have ever before been used. The channel between San Francisco and Goat Island, which must be spanned, is nearly 10,000 ft. wide, clearly requiring a structure of unexampled magnitude. On a 1:100 scale the models will be 100 ft. long. From the information available the

exact use to which the test results will be put is not evident. But whether for actual design use or merely for comparing the behavior of the three suspension designs, they will be of general interest. Revival of model testing in the structural field in recent years has been particularly intensive. Because these California tests represent the most ambitious program yet planned and because the multiple-span suspension designs are of a highly indeterminate and largely unprecedented character, the study constitutes a quite definite step in the revival. Through them structural model testing enters a new range of magnitude.

Underground Erosion

ONE form of action of underground erosion, and its possibilities for soil displacement, are presented in an illuminating manner in the discussion in this issue of the Memphis landslide and the Corpus Christi dam failure. It seems incredible that such large volumes of earth as are computed to have been moved in the Memphis landslide could have been transported by underground and unsuspected water channels of the sizes that may conceivably have been formed. But the reasoning of the discussion is too convincing and authoritative to justify dispute of the statements. With such possibilities of earth movement, underground erosion becomes a phenomenon for major consideration in relation to dams and earth foundations, and a factor in bank stability in excavations for canals and roads. As an explanation of the failure of the Corpus Christi dam, underground erosion has its place among other reasonable explanations that have been offered, but it deserves more attention as a possibility for action and hazard of earth-impounded water. An agency that can activate a Memphis landslide cannot be belittled, however large the earth volumes that oppose it.

A Great Laboratory

IN THE new waterways experiment station at Vicksburg, Miss., the engineers of the army have been provided with a powerful means for serving hydraulic science and engineering. This laboratory is specifically planned for waterways study by models. Within the building and in the field outside are provisions for stream models of larger size than ever before practicable. Models 500 to 1,000 ft. long, reproducing several hundred miles of stream and wide areas of flood land, can be constructed. A large reservoir provides ample volumes of water for such models. Few hydraulic research institutions have these facilities for constructive experimentation in streamflow and flood action, and therefore the engineering art has the right to expect broad enterprise and studious planning in their use. As the experiment station for a specific engineering project—the Mississippi River flood control—the investigations so far undertaken have been directed largely to the solution of problems arising in connection with that project. While this immediate capitalization of facilities is of first importance, the possibilities they afford for general research cannot profitably be subordinated to purely field laboratory purposes. If funds specifically appropriated for flood control cannot be used for general research, Congress and the budget makers should be asked to provide them. The army engineer corps as custodian has a paramount obligation to serve civil engineering through this powerful educational tool that the people have put into their hands.

Prevailing-Wage Laws

NEWS of public construction work being held up in California and Illinois by prevailing-rate-of-wages laws is both surprising and disconcerting. These states are feeling the results of a movement of recent origin, planned to be beneficial to labor but showing the unexpected effect of checking the progress of important work—at the worst possible time, when we most urgently need construction activity. Because of the importance of the situation we report the results of a nationwide survey of the status of prevailing-rate-of-wages legislation in our news pages this week.

Briefly, the facts are: Twelve of the 48 states now have or soon will have some form of legislation governing wages to be paid on public construction. Seven others report regulation of wages by state contracting authorities without a specific law. The nature of the laws in these twelve states is quite diverse. Their operation in some cases is not fully developed; in others, especially those where they are of long standing, little trouble is being encountered. Illinois and California present direct evidence of delays. Last week we reported postponing of work by the Chicago Sanitary District, and this week comes further news of cancellation of highway lettings in Illinois. California has postponed all state lettings until after August 14, the date its new law goes into effect.

Although a few states have had wage laws in effect for years, most of these legislative acts represent the reaction against persistent efforts of some interests, including many contractors, to depress wages. It is a deplorable fact that a certain class of contractors has taken advantage of the stress of unemployment to force wages down to a starvation point. But as in all warfare the fighting often does as much damage as it cures, so here the cure by wage legislation may hurt more than it helps.

The general effects and difficulties of wage rate legislation were discussed in these pages May 28 in reference to the federal Bacon-Davis bill. Wage laws are meaningless and disruptive unless the rates to be paid are specified in the call for bids. Arbitrary readjustment during the life of the work opens avenues of chicanery and graft that will make any sound construction impossible. A change in a contractor's program necessitated by order of the owner is likely to constitute good grounds for a claim. How such claims, based on arbitrary change of wage rates during the life of the contract, will be regarded by the courts remains to be seen.

Wage laws may work out in the end, as, for that matter, even direct government wage and price fixing might be made to work out. Just now, however, the wage laws threaten evil consequences. A setback of important work for a month or two retards recovery. Making the laws workable will require intelligent administration by engineers and officials, or the cost in damage and delay to work may exceed any possible gain. The most tolerable course yet suggested is stating the actual wages to be paid in the specifications or call for bids; but this also is open to many objections.

If contracting were so organized as to prevent the exploitation of labor in times like these, prevailing-wage laws would be unnecessary, but under present conditions such laws seem inevitable as a defensive movement by labor and that element of the public which seeks stability through satisfied labor. It is now necessary to place present laws on a workable basis with least possible delay to construction in the distressed economic situation.

State Financial Control Succeeds

LOCAL public officials in North Carolina no longer determine the financial policies of their tax-levying units. Beginning last March, that state placed the fiscal affairs of all of its cities, towns, counties and special tax districts under the complete and absolute control of a state commission. This move toward the elimination of local government is one of the most sweeping ever taken in this country. The results obtained under it to date indicate that for the conditions in North Carolina it is a great step in the right direction.

The act creating the state commission requires every local governmental unit to obtain from the commission approval of all of its plans and policies for the collection and disbursement of all income. Moreover, the local unit cannot incur any obligation without the sanction of the state commission. Even after such approval has been obtained, the state commission sells any securities that the local unit desires to market. This goes so far as to include notes to local banks given in anticipation of current tax payments.

So complete is the authority given the director of local government of the commission that he may at his discretion, without court action, step in with full powers as a receiver and operate any county, city, town or tax district that has defaulted on either principal or interest of its funded obligations. Under such conditions, payment of these obligations takes precedence over salaries, operating expenses and all other obligations. Moreover, the director may continue to operate the local unit as a receiver until the affairs of that unit are again on a sound basis. During such interval the authority of the director in collecting and disbursing the income of the unit is absolute.

Various other features of the new policy of state control are just as revolutionary. In a word, this policy removes from the local unit, including the larger cities, all authority over its own fiscal policies and places them in the hands of a commission at the state capital.

While such a drastic policy of mandatory state control of local finances may appear as a radical move, the sound administration of this policy in North Carolina has accomplished much in the short time it has been in effect. Local units that were in default have been reestablished as going concerns. In several cases better securities have been marketed, and lower interest rates have been obtained. In fact, the commission has accomplished so much toward the adoption of better business methods and policies in many local units that the people of the state have almost unanimously accepted the new centralization idea as the solution of serious problems.

Whether this one demonstration of the virtue of limiting—or in truth practically eliminating—local control of fiscal affairs will be accepted elsewhere remains to be seen. The conditions surrounding much of the vast sum of outstanding local securities of the several states are not all they should be. Regardless of statutory limitations, topheavy local debts have in many cases been piled up by legalized evasions of the law. Moreover, lack of financial experience on the part of local officials has resulted in many unsatisfactory securities being sold. Interest rates have been unnecessarily high, and lower prices have been taken than the market would have paid an experienced seller.

Awakening public sentiment will not much longer countenance such results of the incompetence or inexperience too often shown by local officials in handling the fiscal affairs of our counties, cities and towns. Nor can responsible financial houses afford to have a part in such unsound business operations. Hence the further results obtained in North Carolina will be followed with close attention. Given honest and competent administration, the plan there adopted may prove to be the solution of a pressing national problem. But in wrong hands the chances for harm are so great that other states doubtless will hesitate to follow this sweeping change in policy. Meantime engineers and public officials will do well not to ignore the trend that is indicated by North Carolina's pioneer move in local government administration.

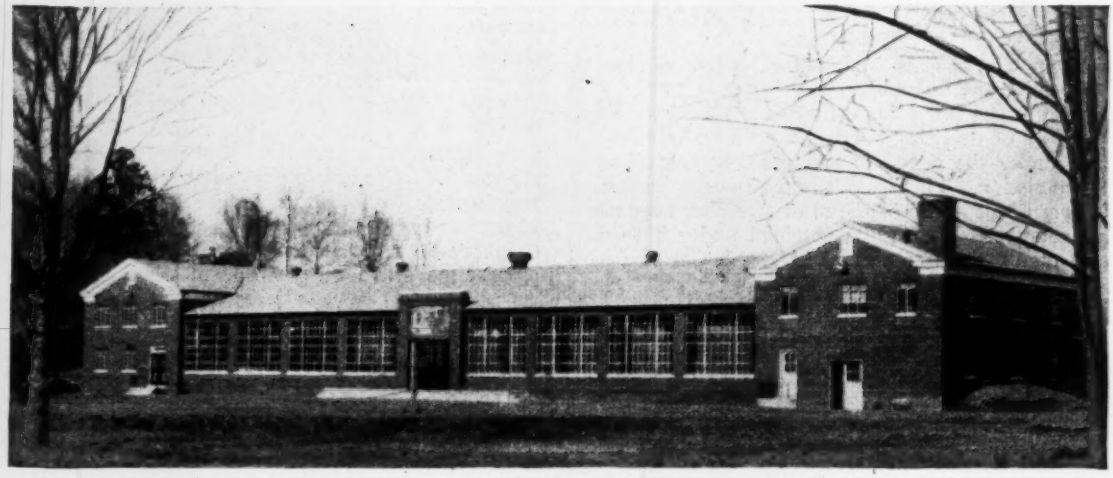
Tennessee Stops Roadbuilding

THREATENED complete stoppage of state highway construction in Tennessee, due to the failure of the recently adjourned legislature to provide funds for continuing the program for the orderly completion of the state system, as is summarized in the news section of this issue, is of more serious import than the people of that state probably appreciate. Extensive mileages of unsurfaced new grading on important routes will entail more cost of maintenance and greater handicaps to traffic than the layman may realize. The disorganization of an experienced and efficient engineering staff and field force that will result also is a serious factor. Failure to continue construction now when work can be done at the lowest prices that appear likely in a generation likewise is poor business judgment. Another important feature is that a large increase in unemployment in the state will be forced just at the beginning of a bad fall and winter.

This grave situation has arisen from a political fight in which the state highway department was the main point of attack. Whatever the merits of the two sides of this fight, or its causes, the fact remains that no evidence was brought out in the legislative investigation to warrant a conclusion that the highway affairs of the state had been conducted either dishonestly or inefficiently. Indeed, R. H. Baker, commissioner of highways and public works, conducted himself with such patience and ability under exceedingly harassing circumstances during the investigation as to convince many of the opposition that they were following the wrong leadership.

In spite of this a minority in the legislature was able, in a jam at the end of the session, to prevent the passage of a bill that would have made available additional funds for construction. Since then there has rapidly developed a statewide sentiment for a special session of the legislature to correct the mistake that was made.

Whether any action will be taken in time to avoid the disastrous results of the cessation of all highway construction in the state remains to be seen. If not, traffic will not be long in finding that it will be most seriously handicapped by the inability of the highway department to maintain the recently graded projects in even reasonable condition. Other results will probably be less evident to so large a percentage of the population, but in some ways they will be as vital. Hence it is to be hoped that the people of the state will demand promptly that the two political factions recognize how greatly Tennessee will be damaged by the stoppage of highway construction at this time and that they set aside their differences long enough to provide the funds necessary to continue the state's highway program at least until the partly finished links in the system are completed.



Laboratory building, waterways experiment station, Vicksburg

Application of Model Research to Mississippi Flood Problems

Plant of U.S. Waterways Experiment Station at Vicksburg, Miss.—Organization for experimental work—Model studies of backwater, cutoffs, embankment overflow and slackwater navigation dams summarized

By HERBERT D. VOGEL
First Lieutenant, Corps of Engineers, U. S. A.
Vicksburg, Miss.

THE INVESTIGATION of models as a means of research in river hydraulics and in structures for stream control is represented by the operations of the new waterways experiment station constructed and directed by the Corps of Engineers, U.S.A., at Vicksburg, Miss. This location was selected because it was the headquarters of the Lower Mississippi Valley division, Corps of Engineers, and of the Mississippi River Commission and also headquarters of the Vicksburg district engineers. The work of acquiring land and planning an organization was begun in December, 1929; construction was begun in 1930, and on Christmas night of that year the laboratory supply reservoir overflowed its spillway.

Experiment Station Structures

In designing the station structures and appliances for conducting tests, full consideration was given to the experience of European laboratories. None of these, however, had problems comparable to those presented by the Mississippi River.

The average European stream carries a small discharge, well confined within banks, and the problem most often recurring is not one of flood protection so much as of channel maintenance. Hence it is customary in Europe to build models of relatively large scale, but only wide enough to include the banks and long enough to cover reaches of a few kilometers. On the other hand, any typical problem of the Mississippi demands a model representing wide overbank areas and long reaches. A model of the Greenville Bends, now in operation at the experiment station, represents 98 miles of river length and faithfully duplicates the entire leveed trough in its effort to show the effects of cutoffs.

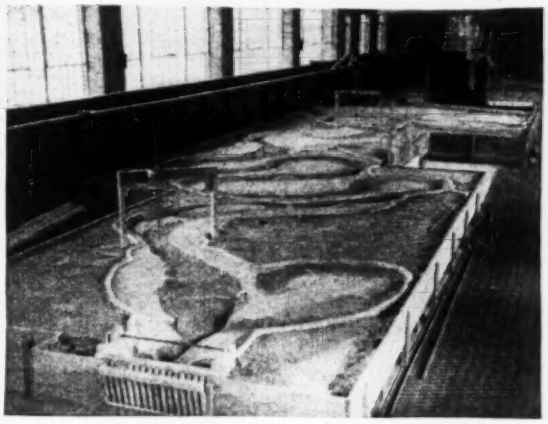
The great variety of large-dimensioned models anticipated gave indication at the very beginning that the new laboratory must have considerable flexibility, obtained by providing within the building a large area of free and unhampered floor space and by the purchase of sufficient land to allow the prosecution of outdoor experiments and permit possible expansion.

Dam and Reservoir—Since it is expensive to pump large quantities of water, and because pumping requires the employment of large overflow tanks and may even then be an unsatisfactory expedient, it was decided to select a site where a dam might be constructed to create a large supply reservoir. The location selected is 4½ miles south of Vicksburg on a small tributary of the Mississippi River, and it embraces 140 acres. Construction of a dam and spillway, so designed that cuts practically balanced fills, was begun in April and completed in October, 1930.

The dam is 400 ft. long and 19 ft. high, with an 8-ft. crest and 1-on-3 side slopes. It is protected from wave wash on its upstream face by riprap, and from erosion on the land side by Bermuda grass. The dam and spillway together impound a 40-acre artificial lake of 200-acre-ft. capacity, with a maximum depth outside the old channel of 11 ft. An 8-ft. normal freeboard is provided by the dam to accommodate the maximum known rainfall, and to permit utilization of flashboards when necessary to increase the reservoir depth.

To provide for channel flow during the construction period, to facilitate emptying the reservoir in an emergency and to supply a large discharge to the creek downstream when models are built therein, a rectangular concrete sluiceway was constructed below the base of the dam, normal to its longitudinal axis. Flow through the sluice is controlled by a vertical-lift gate, and a 7-ft. circular steel conduit carries the dicharge via a concrete box elbow to the creek bed. Also emptying into the creek at a near-by point are the discharge pipes from the laboratory building.

Laboratory Building—The main building, of brick on a steel frame, is rectangular and consists of a single-story experiment hall flanked at each end by a two-story wing



Model of Greenville Bends in Mississippi River

This model embraces 98 miles of river and all over bank area between levees from 1¼ to 14 miles apart.

33x51 ft., while the width of the central hall is 49 ft. The over-all length of the building is 209 ft.

The west wing has three offices and a large computing and drafting room on the second floor, while the floor below is divided into space for a carpenter shop, a photographic dark room and a sediment-reduction laboratory.

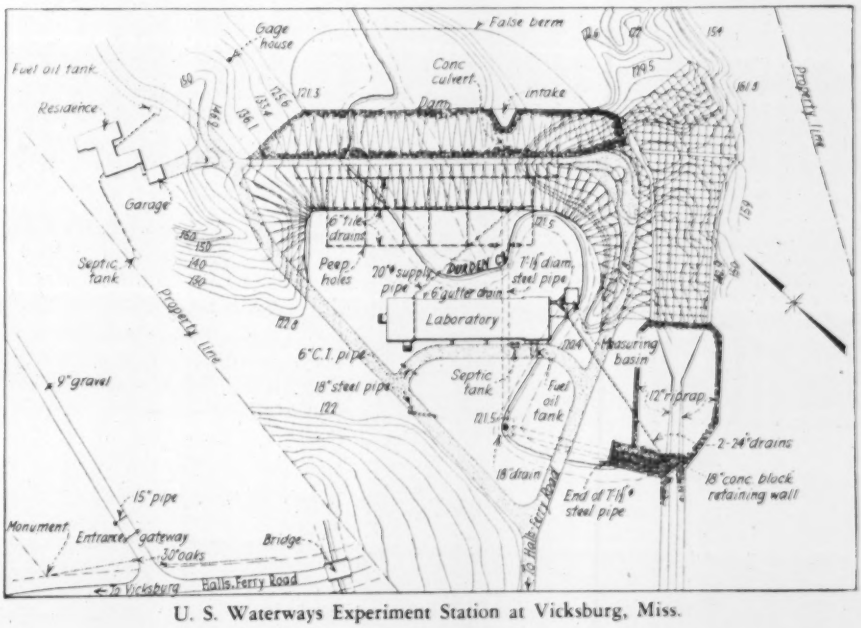
The east wing is not walled off from the experiment hall except on the second floor and for that portion of the first that constitutes a boiler room. Hence the floor of the experiment hall is continuous to the east end of the building. This is partly to accommodate a 175-ft. hydraulic flume, making it accessible at every point up to where it leaves the building, and partly to provide an open pump room, readily controlled from the experiment hall. There are two pumps and together they deliver 5.1 sec.-ft. of water to a constant-head tank directly overhead, from which gravity flow is obtained to the models. This system supplements the flow from the storage reservoir and prevents excessive draw-down in possible periods of drought.

Water from the outdoor reservoir is supplied to models within the building by a 20-in. pipe, which has a control valve at its intake. This pipe passes through the dam on top of the concrete sluiceway previously described, makes a 45-deg. bend, runs along the ground surface and bends again to enter the building and cross it transversely below the floor level, at the west end of the experiment hall. One 12-in. and two 8-in. tees with valves and elbows are provided for connections to the models. A 20-in. valve near the north wall controls flow to the steel hydraulic flume, which runs the length of the building to discharge to a large outdoor measuring basin. Double-acting gates divert the flow at the discharge end to either the waste pipe or the basin.

In this flume, the cross-section of which is 3x3½ ft., it is possible to calibrate weirs and current meters, conduct experiments on model dams and perform sundry tests of similar nature. It is the only fixed piece of equipment on the main working floor, which constitutes otherwise a vast open space, free of supporting columns and other obstructions. Both sides of this working area, or experiment hall, are glass-inclosed, so that plentiful illumination is given during daylight hours. High-powered lamps in reflectors overhead serve to provide light at night.

The floor is of concrete, with sufficient slope to drain toward the center, where a sunken return channel runs from the vicinity of the water inlets to a sand trap at the east end of the hall. Water leaving the sand trap flows across a steel diversion flume to the deep reservoir, whence it is wasted or circulated as the case may require. Between the sand trap and the deep reservoir and crossed by the flume just mentioned is an intermediate chamber, calibrated for volumetric measurements. By raising a trap in the diversion flume the water ceases to flow to the deep reservoir and drops instead to a measuring basin. A vertical pipe with needle gages against glass windows permits observations and readings in an adjoining pit. All the reservoirs and pits described, together with the return channel, are covered by gratings that may be removed at any time.

Organization for Experiment—Problems are sent to the experiment station for solution by the president of



U. S. Waterways Experiment Station at Vicksburg, Miss.

the Mississippi River Commission, but requests for the performance of research work may originate in engineer districts outside his jurisdiction. The laboratory director is designated an assistant to the president, and as such he works directly under the operations division of that office. The main working unit within the organization of the experiment station consists of four groups with responsibilities as follows: group 1, photographic and soils testing laboratories; group 2, sediment laboratory and erosion studies; group 3, hydraulic studies; group 4, model construction.

Each of these groups is in charge of an engineer, specially versed in his particular science and well trained in research methods. A score of lesser assistants and laboratory helpers are employed to aid in performing experiments.

To describe in any detail the work that has been accomplished since Jan. 1, 1931, is of course impossible, but a short outline of each of several typical tests may convey an idea of the general problems coming before the laboratory.

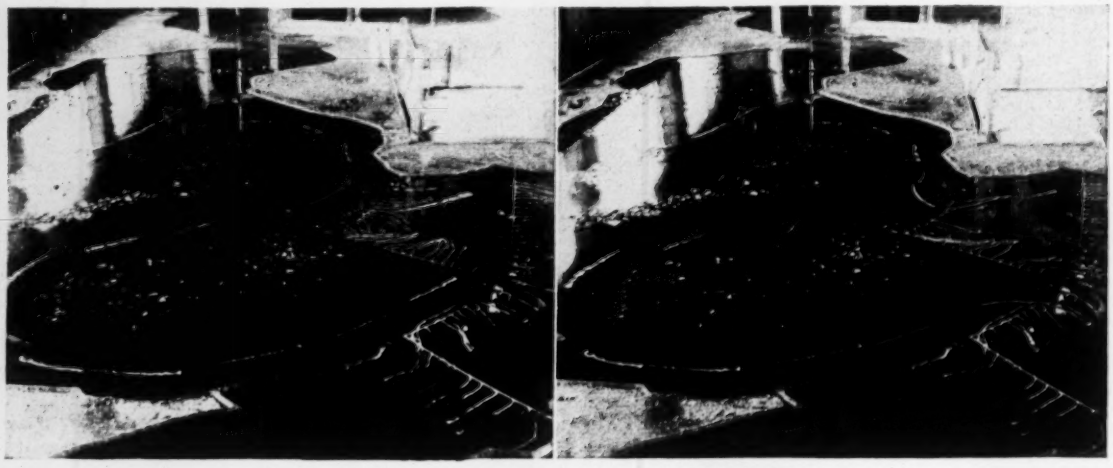
Typical Experiments and Results

The first model built at the U.S. Waterways Experiment Station was a replica of the Illinois River between Havana and Grafton; and with its 590 ft. of length it was, without doubt, the longest model ever built anywhere. The purpose of the experiment was to determine the limit of backwater effect from the maximum recorded stage of the Mississippi against a maximum probable floodflow of the Illinois River and against the flows of 1904 and 1926. The results were published in *Engineering News-Record*, June 11, 1931.

The Greenville Bends Model—The territory covered by this experiment extends from immediately below the mouth of the Arkansas River to approximately 4 miles below Lake Lee. The Mississippi River through this territory is noted for its extreme meanders, the north and south distance being 42.5 miles; whereas the distance by river is 98 miles. The direct distance between Arkansas City, Ark., and Greenville, Miss., is 16 miles; whereas by river it is about 41 miles. In this area the distance between the levees varies from a minimum of about 1.5 to a maximum of 14 miles.

The purpose of the test was to obtain experimental data relative to a cutoff at Tarpley Neck. The experiment covered mainly two high-water flows: that of 1929, or 1,738,000 sec.-ft.; and that of the adopted project, or 1,950,000 sec.-ft., which would bring the fuse-plug levee of the adopted project into operation.

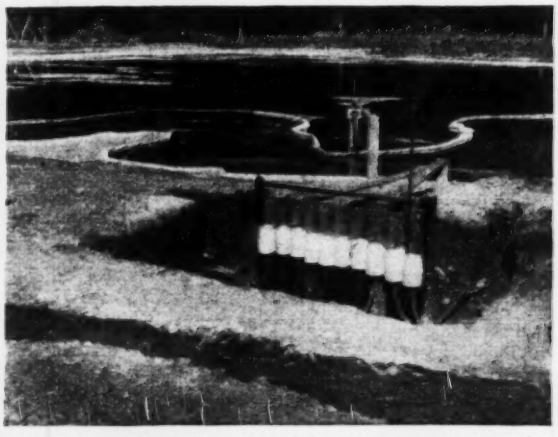
The model covered the section of the Mississippi River from mile 401 to mile 499 below Cairo. It was built to a horizontal scale of 1:4,800 and a vertical scale of 1:360. The 1930-31 quadrangle maps, 1:48,000 scale, were used in conjunction with the 1925 1:10,000 scale surveys by the Mississippi River Commission, and, in addition, many local surveys by the Vicksburg Engineer District.



Greenville Bends model under test with overbank flow

Left: strings show direction of flow before cutoff.
Right: strings show direction of flow after cutoff.

Galvanized-iron templets, cut to represent typical cross-sections, were placed on a prepared base to outline the configuration of the river channel, while intermediate elevations were established by pegs. The model, as first constructed, was of sand with a concrete covering where the soil is protected by heavy growth. Gravel was added to simulate rough overbank conditions. Observations obtained with the model in this condition showed a marked discrepancy from the observations actually made on the river in 1929. To produce corresponding flowlines it was decided to concrete the model entirely and remove all gravel from overbank areas. It was noted that the flowlines of model and prototype were still out of



Model for Yazoo River backwater tests

agreement. A covering of gravel was once more applied to overbank areas. In the final case the stones were laid with great care and in positions corresponding to the locations of wooded areas in nature. Observed flowlines were now found to be in close agreement, and the model was adjudged correct.

Elevations for the flowlines were obtained by the use of two needle gages and by pipes placed flush with the channel leading to stilling wells, where a hook gage was used to obtain measurements. A V-notch weir was used to measure the discharge into the model.

Enough water was sent through the model to bring the water surface to a predetermined reading on a gage at river mile 430, after which the tail gate was adjusted to produce the corresponding 1929 river stage at mile 491.5. Readings were then taken on all the gages and recorded. Subsequently, and without changing conditions of flow, a cutoff was made at the indicated point and a reading on all gages was taken.

Model of Birds Point-New Madrid floodway under test

The discharge scale was computed by the formula that they are reduced above, but the proof presented by the model appears irrefutable. In more than a hundred sets of observations the same general effects were observed, and in no case was there an increase below, except for a slight increment produced temporarily by the reservoir drawdown. Following hydraulic adjustment of the river there can be no change in stages a few miles downstream from the cutoff, since the same amount of water is coming down as before the cutoff, and no change has been made in the resistance offered to flow. The discharge, velocity and area of cross-section below the cutoff remain the same, and hence the stage downstream is unchanged. Above the cutoff, velocities are greater by reason of the increased slope, and hence stages are lower.

$Q = \frac{a^{\frac{5}{3}} s^{\frac{1}{2}}}{np^{\frac{2}{3}}}$ in which all factors were known from the original linear scale assumptions, with exception of the coefficient n, values for which were based on best-known data. The computed result was 1:21,000,000, and when runs were actually made on the model to reproduce flowlines this was found correct to within 1 per cent.

To observe the flow through the cutoff and to ascertain the direction of the currents, dye was inserted into the river above the cutoff. A pronounced eddy was observed in the area where the bar was formed. This would account for the formation of the bar. The lowering of the stage at river mile 476 could also be attributed to its influence.

Threads were placed in the model to show the directions of currents before and after the cutoff had been made, and photographs of the two conditions were obtained. It is to be noted that the threads are straight and show currents well within the channels before a cutoff, while afterward they are slack in Spanish Moss Bend. This is due to the slowing of the current around the bend, where a typical horseshoe lake will be formed.

The model showed a maximum lowering of 2.2 ft. due to a cutoff at Tarpley Neck, the influence being felt for a distance of 45 miles above with no change below. This is almost direct contradiction to the old theory, offered first in this country by Humphreys and Abbott, that stages are increased below a cutoff by the same degree

The model gave no indication of detrimental effects due to cutoff, but on the other hand showed a slight tendency toward improved conditions at Leland Neck. The reduced head above Leland Dike, produced by a cutoff at Tarpley, relieved the strain on that structure to some degree and resulted in lowered velocities through it. It is to be expected that Chicot Point will be severely attacked by increased currents through the cutoff; but if erosion occurs, it will be along the line of a shallow chute now existent, and revetment of the east bank will resist attack. Erosional adjustments that follow will produce a sinuous channel in due course of time.

Hydraulic Studies of Dam No. 37, Ohio River—To determine a feasible design for a new dam to replace No. 37 on the Ohio River at Cincinnati, tests were begun at the experiment station early in January, 1931. Not only was it desired to create a higher structure and a correspondingly deeper upper pool, but every effort was urged to find a design that would reduce the difficulties encountered with the present wicket-type dam. The proposed designs were: (1) a gravity-section, ogee-type dam, with fixed crest to raise the upper pool 7.9 ft. above its present elevation; and (2) various combinations of wickets, beartraps and Boulé gates to accomplish the same result.

Details of the experiment were planned for determination of: (1) the stage at which the dam would drown out sufficiently to permit navigation of the pass both upstream and downstream; (2) the height of lock walls and gates required to carry boats through the lock until the navigable pass could be negotiated; (3) the direction and velocity of currents affecting both the upper and the lower entrances of the lock chamber; (4) the scouring effects of the toe of the dam for the design selected for further consideration.

After detailed study it was decided to build the model with a horizontal scale of 1:300 and a vertical scale of

1:60, and to such a length that conditions of flow might be investigated for distances of 4,000 ft. and more—and downstream from the dam. The method of construction was practically identical to that employed for the Greenville Bends model.

To supplement the experiments made on the distorted model and to obtain a closer determination of the differences in pool elevations, an undistorted model was subsequently built to a scale of 1:120. Because of the larger scale used, a shorter reach of river was represented in the second model, but the first was well able, by itself, to give flow conditions within the limits established. The effect was that of placing a large magnifying glass over the critical section to permit more accurate observations.

Having obtained complete adjustment of both models, the proposed structures were built in, one after another, with sufficient runs being made for each set-up to investigate the situation. Studies of velocities and directions of currents were made, however, only in case the design was such as to show a reasonable drowning out of high stages.

In order to study the scouring effects at the toe of the dam under consideration, creosoted sawdust was inserted above the structure while the model was in operation. It was observed that the bottom layer of the water immediately below the dam stood practically motionless, the entire movement of water being confined to upper portions of the pool. This indicated that there can be no danger of excessive scour during intermediate and high stages. Erosion might occur at low stages were the material of the bed less resistant in character, but the adopted design is such as largely to eliminate even the remote possibility of dangerous conditions.

Other Experiments—In addition to the experiments described above, tests relative to the Bonnet Carré and Bird's Point-New Madrid floodways have been completed, as well as one investigation on a full-scale model of a railroad embankment (*ENR*, June 11, 1931). Experiments now being conducted include: (1) investigations of means to improve conditions of backwater area; (2) tests on levee sections to determine rates of seepage and positions of limiting lines of maximum saturation; (3) tests on a model of the Ohio River in the vicinity of Paducah, Ky.; and (4) an investigation of the effects that may be produced by a series of cutoffs between the mouths of the Arkansas and Old rivers.

South Carolina Highway Fills Pre-Shrunk by Pressure Jetting

Method found equally useful for new fills and for old embankments where subsurface shrinkage has been hidden by surface crusting or arching

VIRTUALLY ALL embankments over 5 ft. high on South Carolina highways are being pre-shrunk by pressure jetting before placing pavement. The practice applies to old as well as new fills. It began in a large way in 1929. This first experience gave such successful results at little cost that jetting was adopted by the state highway department as general practice.

Shrinkage Experience

Studies of numerous cases of bad cracking of practically new concrete pavement indicated that the subgrade fault to be blamed for such failures was traceable largely to shrinkage, and especially to irregular shrinkage. Moreover, there were cases where fills that had been in use as long as six years showed enough shrinkage to cause bad cracking of a concrete slab placed on them. In fact, heavy settlement was common in these older fills adjacent to culverts, bridges and other places where the grading equipment used in placing the fill could not be maneuvered to secure compaction.

Close study of the behavior of the older fills in particular developed the fact that gravel, sand-clay or top-soil surfacing formed a crust or arched over local settlement. Such settlement varied in frequency and extent. It has not been at all uncommon to find comparatively low fills that had been in place and in use for some years that would settle under jetting in irregular spots from 6 in. to 1 ft.; long stretches go down 2 to 4 in., with greater settlement at intervals. When the temporary surfacing on the old embankments was scarified or removed in preparing the subgrade for the pavement, local settlement under the crust was disclosed where no prior breaking through of the arched material or other surface evidence of the settlement appeared. Sooner or later the concrete slab gave way over these gaps, failure often occurring shortly after the opening of the road to traffic.

Fills on South Carolina state highways have for years been placed under specifications that are commonly expected to insure good compaction. The soils of the state present a wide range of types. Few of them, however, have any characteristics that should cause more trouble from irregular settlement than might be encountered elsewhere. The rainfall over the state also is moderately heavy, thus insuring as much natural embankment saturation as would be found in most parts of the country. Furthermore, there is never enough frost to cause serious heaving. Hence there are few exceptional local conditions to produce peculiar or extensive irregularity in the settlement of fills.

Jetting Methods

The method of jetting embankments is simple. Actual execution, however, requires close and constant observation of the results being obtained as the water is used. The type and character of soil must be studied to insure complete saturation without washing. It is therefore necessary to vary operations frequently. Jetting is required to be finished at least six weeks in advance of the placing of the pavement in order to permit the fill to drain and settle firmly before any pavement is laid on it.

Before jetting is started the surface of the fill, whether old or new, is plowed to a depth of 6 to 8 in. Then the jets are sunk in longitudinal rows 5 ft. apart, with the holes staggered 5 ft. in the rows. Occasionally, when the top of an embankment is very dense and tough, the holes are opened with a pick or a bar well down through the top layer.

Water for jetting is pumped from the nearest available source with portable outfits such as are commonly used in paving operations. Pump set-ups and pipe-line conditions vary, but no more than in delivering water

Left: laborer sinking long jetting pipe; ponding on embankment in the background. Right: wavy embankment surface produced by jetting; material piled on subgrade to make up settlement

for a large paving mixer. The jets are ½-in. standard nozzles on 1-in. pipe. The length of the latter is varied according to the height of the fill by adding or removing sections. Heavy hose forms the connection between the jet pipe and the supply line from the pump. On fills not over 10 to 12 ft. in depth, a single laborer handles each jet. On higher fills some contractors use two or more men, or a block and tackle on a field-built tripod, to handle the longer jet pipes needed.

The specifications call for a pressure of not less than 40 lb. at the jets while they are in operation. In practice, somewhat higher pressures are used but never greater than are needed to sink the holes at a reasonable speed. With varying soil conditions pressures have to be varied, but this is seldom found necessary on any single fill. With close inspection and shifting of the jets when washing begins, it is possible to get complete saturation of the embankment without damage or loss of material.

The water jet opens a hole so that the jet pipe may readily be pushed down. In fact, care has to be used that the jet does not go down too fast. Under the right inspection the laborer on the jet soon learns how to keep a hole properly filled with water. Since saturation of the fill occurs irregularly even in adjacent holes, no fixed time schedule is possible. However, constant observation enables the inspector to determine when the embankment is well saturated.

Where a fill is on a grade the soaking is started at the lower end. As the fill appears to be saturated the work is carried ahead the full width of the top of the embankment. Occasional low cross-dams are thrown up on the road surface to pond the water in such a way as to keep the jet holes full of water for not less than 30 minutes. Now and then the jet operator has to return to fill a hole or two in a place where it is evident that the first soaking did not saturate the fill thoroughly.

The jets are run down to the original ground surface on which the embankment was built. If flowing water breaks through the slope of an embankment during jetting, the soaking of that particular hole is discontinued temporarily and the jet applied to adjacent holes. With saturation secured at these adjacent holes, the jet is tried again in the hole that has been temporarily abandoned.

At least two weeks prior to the placing of pavement on fills that have been jetted the contractor is required to fill all depressions with enough new material to bring the subgrade to the right level. In doing this the new material is thoroughly saturated after it is placed, and the subgrade is rolled in the usual manner before pavement is laid.

Contract prices on pressure jetting have ranged from 1½c. to 3c. per cubic yard of embankment. These prices include all labor, materials and equipment. In most cases the contractor who constructs the pavement does the jetting. Charles H. Moorefield is state highway engineer of South Carolina.

English Railway Lays 90-Ft. Rails

To determine the influence of long rails and fewer joints on the riding qualities of trains, the London & Northeastern Railway has laid a mile of main-line track with 90-ft. rails of 95-lb. bullhead section, replacing the former 60-ft. rails. No other alteration was made in the track, which has the usual English cast-iron chair supports and widely spaced ties, giving 36 ties to each 90-ft. rail length. It was calculated that theoretical expansion under the local extremes of temperature would require a joint spacing of about $\frac{7}{8}$ in. for these long rails; but as it is known that actual expansion is considerably less, the spacing given was $\frac{3}{8}$ in. at 60 deg. F. The long rails, transported on a series of flat cars, were lowered by means of five or six rail tongs on chains controlled by ratchet levers, the chains being released when the rails were within 2 ft. of the ballast. Vertical skids hooked to the cars guided the rails clear of the axle boxes. After being distributed the rails were placed in the track chairs by hand and then fastened and spliced in the usual way. This experiment was planned by John Miller, chief engineer of the railroad. Rails 98.4 ft. long (30 m.) are used extensively in France and Germany, but these are of T-section.

Earth Slips and Subsidences From Underground Erosion

By Dr. KARL TERZAGHI
Professor, Technische Hochschule, Vienna, Austria

Action of underground erosion as disclosed by Memphis landslip considered as a possible cause of the Corpus Christi Dam failure

IF THE GROUND below a dam or a natural barrier to impounded water contains layers or zones more permeable than the surrounding soils, they become the seats of intense groundwater currents, because lines of flow are drawn toward these zones somewhat as the lines of force are drawn toward a strip of iron in a magnetic field. The physical action is as follows: starting at the point where a zone of weakness opens into free drainage, erosion works backward into the groundwater carrier, scours a cavity in the permeable stratum and ultimately brings about the collapse of the roof of the cave. These statements epitomize the theory and action of underground erosion, which has caused many landslips and subsidences.

The Memphis Landslip

The most impressive subsidence and slip due to underground erosion with which the writer has had direct experience occurred on the high bank of the Mississippi River at Memphis, Tenn., and caused the collapse of a building and other structures indicated by Fig. 1.

The building was located at the rim of a platcau, about 100 ft. above the zero water level of the Mississippi River. Soon after the crest of the 1926 flood had passed, a belt of land about 100 ft. wide and 700 ft. long, parallel to the river, started to subside about 1 ft. per hour. The subsidence continued until it amounted to about 30 ft. The subsided area was bounded by smooth steep sliding planes and was separated from the river bank by a sharp-crested ridge of clay about 60 ft. wide.

The indications were that the first movements were almost vertically downward. During the following months the ridge, which separated the subsided area from the river, gradually flattened. Its crest moved about 75 ft. toward the river, the ruins of the building moved about 50 ft. in the same direction, and with the outward movements there was additional subsidence. The approximate elevations of the subsided area were: immediately before the accident, 160 ft.; in 2½ months, 100 ft.; and one year later, 97 ft. Fig. 1 *A* to *D* shows the successive stages of the subsidence.

Ground Conditions—Borings made shortly after the subsidence disclosed these underground conditions: East of the rim of the subsided area, in the undisturbed portion of the plateau, the top layer is a bed of brown, plastic, fairly stiff clay. The bottom of this clay bed is about 45 ft. above zero water, and it is between 40 and 60 ft. thick. Below zero water is a very stiff, dark gray, highly plastic clay. Between the two almost impermeable layers of clay there are permeable strata about 45 ft. thick, of pure, very uniform quartz sand with rounded grains, with a grain size of about 0.20 mm.

Beneath the subsided area the borings showed the permeable stratum almost wholly absent (Fig. 1 *C*). On first inspection the accident seemed almost incomprehensible, because it was impossible to locate the exit of the channel through which the immense quantity of sand (assuming the original condition to have been that shown by Fig. 1*A*) could have escaped at a rate of 50,000 cu.ft. per hour for 30 hours.

Action Exemplified—Fortunately, not far from the subsidence the Mississippi River had performed a small-scale experiment of a similar type on the surface of a clayslide near the river bank with all the elements of the process fairly open for inspection. Fig. 2*A* is a cross-section of this slide.

During the flood the shallow depression near the rim

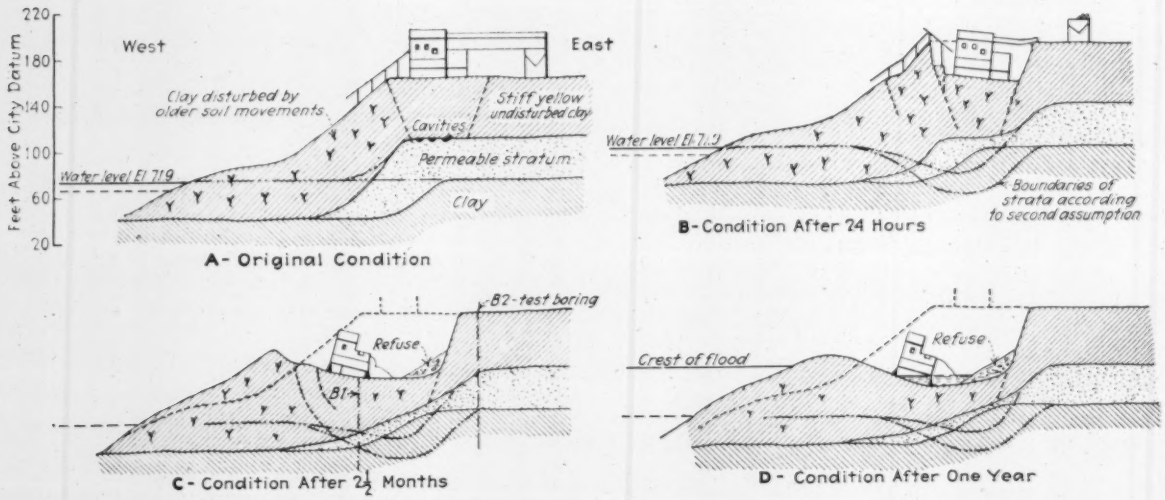


Fig. 1—Sequence of movements in Memphis landslip from underground erosion

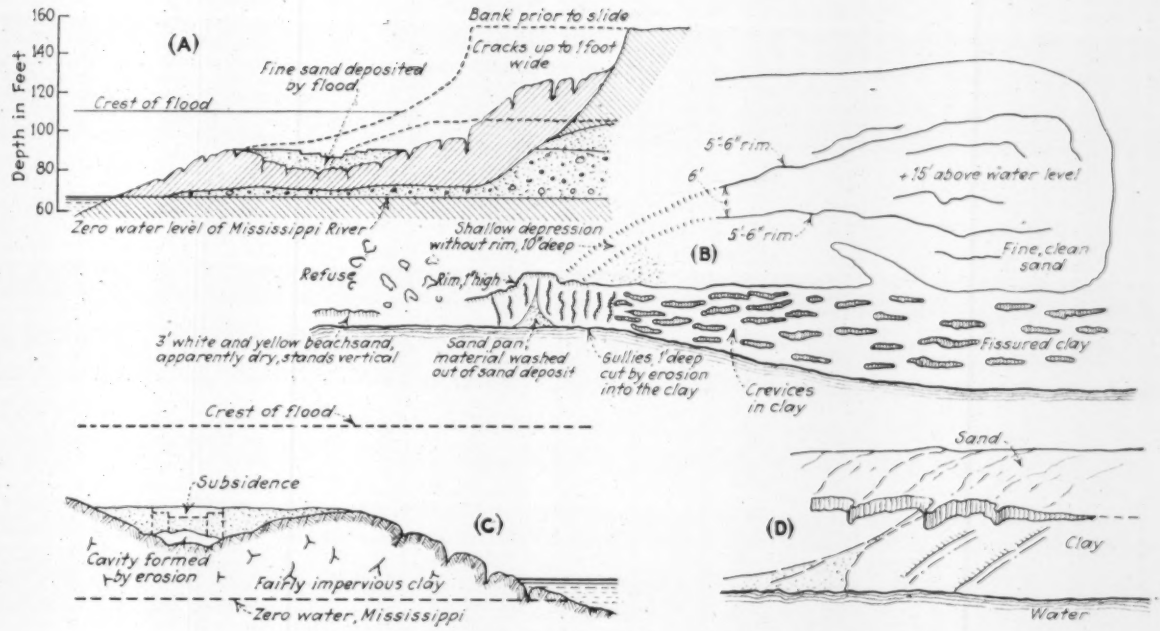


Fig. 2—Phenomena of underground erosion at small slide

of the slide was covered with a deposit of fine, clean and uniform sand. The surface of this deposit showed a local subsidence like a shallow trough bordered by steep steps, very similar to a miniature valley extending upstream and opening toward the river. Fig. 2*B* is a plan of the sand flat, and Fig. 2*C* is a cross-section. The bottom of the trough was slightly concave.

It was obvious that the trough was not formed by surface erosion, because its bottom was smooth and the steps very well defined. The character and the position of the steps plainly indicated that the material was removed along the bottom surface of the sand deposit and that the trough had been formed by subsidence of the roof of a cavity. The process of subterranean erosion became clear when inspecting the northern end of the miniature valley. There the sand deposit abruptly ended with a vertical face about 1 ft. high. From that face small steep gullies extended across the clay slope toward the water's edge, indicating the places where water had drained out of the sand. At one point a fan of material that obviously had been washed out of the sand deposit extended down the slope (Fig. 2*D*). The topography of the miniature valley indicated that the major part of the underground erosion took place in the southern part of the deposit. From this part toward the outlet the underground channel evidently became narrower and merely served the purpose of transporting the material toward the outlet.

Explanation of Main Slide—The subsidence (Figs. 2*A* to *D*) is a small-size model of what had happened on a large scale, as shown by Fig 1. Since the slope of the terrace along the river was covered with a heavy blanket of feebly permeable clay, the groundwater was stored under head in the permeable stratum east of the slope and was trying to open up an outlet somewhere toward the waterfront. The outlet very likely followed a crack or fissure in the clay, parallel to the rim of the plateau, with a discharge opening through a mass of clay chunks and refuse. This location was suggested by the presence of a narrow appendix to the subsided area. As soon as the outlet channel was formed, the water stored up behind the barrier of clay drained out and carried with it the fine round-grained sand of the permeable deposit behind the barrier.

Assumptions Regarding Action—Concerning the manner in which the sand was removed from beneath the subsided area, two assumptions suggest themselves:

1. Open channels were washed out near the upper surface of contact between the sand and the clay, the channels being arched over by the clay. The channels deepened and widened until the shearing stresses in the clay exceeded its shearing strength; steep shearing planes were formed, and the roof of clay went bodily and vertically downward. Considering the shearing strength of the clay, the unsupported span of the clay could nowhere have been greater than about 10 ft. Hence several channels should have existed and erosion should have continued while the roof went down. Furthermore, to account for the difference in elevation of 35 ft. between the bottom of the gravel stratum encountered in the two test borings B1 and B2 (Fig. 1*C*), it must be assumed that this difference existed prior to the subsidence. It seems unjustified to assume that there were any movements within the clay located below the permeable stratum. In Fig. 1 the first assumption is represented by unbroken lines separating the strata. Since the subsidence occurred over an area of about 53,000 sq.ft., at a rate of about 1 ft. per hour, the quantity of sand removed should have been about 15 cu.yd. per second.

2. A single channel formed near the lower surface of contact between the permeable stratum and the clay. This channel was arched over by the sand and gravel. As soon as this arch collapsed, an intimate mixture of sand and water was formed, which had the properties of a liquid. The difference in elevation of 35 ft. between the bottom of the gravel stratum at the two borings was then due to the flowing mixture of sand and water cutting a channel into the clay. In the profiles, Fig. 1, this second assumption is represented by dotted lines.

Because of the few borings it was not possible to decide whether the first or the second assumption conformed to the truth. Neither could it be discovered

whether the erosion preceded the subsidence or occurred simultaneously. These uncertainties, however, do not alter the fact that more than 1½ million cu.ft. of material was transported underground in less than 48 hours over a distance of more than 1,000 ft. under a head of less than 100 ft. and left the ground without anybody noticing the place where the mighty stream discharged.

Characteristics of Underground Erosion—The Memphis landslip discloses the characteristics of underground erosion: (1) Erosion by necessity is confined to a channel similar to a narrow tunnel. (2) The bulk of the transported material is fed into this tunnel through its upstream end. At this end the hydraulic gradient is at a maximum, and at the same time the soil is transformed into a semi-liquid and flows from all sides toward the cavity, while in the downstream section the walls of the tunnel are fairly rigid, because in that section the soil is already drained. (3) The process of feeding material into the upstream end of the tunnel causes the tunnel to work its way into the water-bearing stratum along the line of least resistance. (4) With increasing length of tunnel both the hydraulic gradient at the "heading" of the tunnel and the discharge increase. For this reason the amount of scour and the corresponding surface subsidence increases with the distance from the point where the process started. (5) In an advanced state of the process a fairly sharp distinction seems to exist between a wide zone of disintegration and scour, representing the feeding area of the underground system, and a relatively narrow channel of transportation that leads to the point where the process originally started. (6) Finally, the roof of the drainage area collapses. (7) Since actual scour is confined to a very limited zone (the "heading" of the tunnel), and since a feeble hydraulic gradient is sufficient to wash the disintegrated material through a tunnel or a flume, underground erosion is *apt to occur at surprisingly low hydraulic gradients, provided the process is favored by the presence of a fairly continuous system of lines of weakness.*

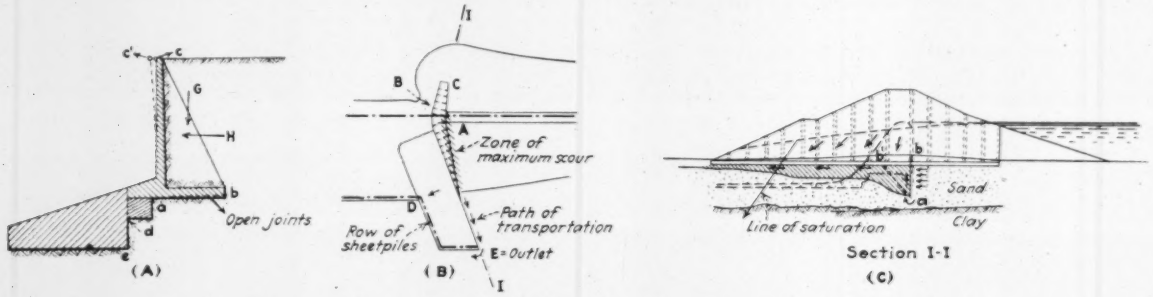


Fig. 3—Possible action of underground erosion at Corpus Christi Dam

Corpus Christi Dam Failure

The failure of the Corpus Christi Dam seems to have been due to processes similar to those of the Memphis slide, but with the water stored up by an artificial barrier. The essential facts of the failure were published in *Engineering News-Record*, Dec. 18, 1930.

Since the collapse started at the junction between the concrete section and the embankment, attention is concentrated on the retaining wall. This wall (Fig. 3*A*) was a reinforced-concrete buttressed wall, the stability of which depends on the weight *G* of the earth above the base. The earth pressure that acts on such a wall does not attain its theoretical value (Coulomb value) until the wall has yielded or tilted. This is particularly true of a retaining wall of the type shown because, due to wall-friction, the full weight *G* does not act on the base until it has tilted upward. While this wall was backfilled, it tilted around point *a*, and a narrow joint opened up between the soil and the rim *b* at the base.

Water probably reached the base of the retaining wall through the saturated part of the adjoining embankment. Finally the sheetpiles on both sides of the critical cross-section seem to have failed to reach the clay, and in spite of the 8-in. drains, this fact undoubtedly helped to build up the pressure near the critical point.

From *A* (Fig. 3*B*) toward the downstream foot of the embankment, the base of the retaining wall was therefore in contact with soil saturated with water under an appreciable pressure. In case a line of weakness existed leading from the base of the retaining wall either toward an open joint in the row of sheetpiles at the corner *D* (Fig. 3*B*) or at point *E*, all the requirements for underground erosion were present.

In the opinion of the writer the "line of weakness" was represented by the surface of contact *d e* (Fig. 3*A*) between the concrete and the ground. If this opinion is correct, erosion should have started at the point *E* (Fig. 3*B*). From an exit at *E* erosion worked its way backward, and it scoured beneath the wall in a fashion similar to that in which it scoured beneath the building in Fig. 1. part of the water required for the work being fed toward the zone of erosion through the embankment, particularly through the narrow body of embankment contained in the cutoff trench, and the remainder through the sand between the clay and the lower rim of the sheetpiles near *B* (Fig. 3*B*). Fig. 3*C* shows this scour in an advanced state immediately before the collapse.

According to the preceding statements, the collapse should have been associated with the following processes: a "slump" or the formation of a funnel at point *B*, because the path *BA* represented the shortest connection between the reservoir and the zone of underground erosion. At the site of the cavity the combined earth-and-water pressure should have forced the sheetpiles from the position *ab* into the position *a b'*, an incident which actually occurred. Finally, due to the fact that the scour was confined to the belt *b* (Fig. 3*A*) of the soil beneath the base plate, the retaining wall should have tumbled backward toward the embankment. This conclusion too seems to agree with the observed facts.

Thus it appears to the writer that the failure might have been essentially due to the absence of "cutoffs" or "collars" along the surfaces *b a d e* (Fig. 3A). An unbroken vertical surface *e d* and the smooth vertical rim *b* (Fig. 3*A*), both located parallel to the direction of the current, appear particularly dangerous.

Some Theoretical Considerations on Landslides

By DIMITRI P. KRYNINE
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LANDSLIDES that have given trouble in Ohio, in West Virginia and in a portion of Pennsylvania are in most cases due to geological causes, such as unfavorable strata with moist surfaces. A completely homogeneous soil may slide, however, when the geometric shape of a part of the soil mass becomes unstable. For example, when a trench reaches a certain depth, slips as shown in Figs. 1 and 2 begin. This is the simplest type of "geometric" sliding, if such a term may be used. For each soil the vertical slope becomes unstable at a certain height; for each angle of slope there is a maximum height.

Whatever the cause, a part of the soil mass slides along a surface. This surface, in the cases of geometric sliding, is always curved and not plane as is stated in many textbooks. The movement of the soil along the sliding surface takes place when the acting force overcomes the sliding resistance. The sliding resistance is due to: *(a)* cohesion of particles, which is considered to be uniform in any direction; and *(b)* friction of the particles in contact along the sliding surface AB (Fig. 3). Consider any element of the sliding mass $CDEF$: on its bottom, EF, the weight W may be resolved into *(a)* a normal force $W \cos \alpha$, which, being multiplied by the coefficient of friction f of the soil, gives a frictional resistance $fW \cos \alpha$ along the line EF; and *(b)* a force $W \sin \alpha$, which is the acting force. Suppose that c represents the cohesion per unit of area; then the resisting force along the element EF, one unit wide, would be $cEF + fW \cos \alpha$. Along the whole surface AB, the resistance equals the sum of elementary resistances, which increase toward the lower end (A, Fig. 3).

The first means of increasing the sliding resistance is to increase both c and f, principally c. As is well known, the cohesion of clay depends on its water content. Dry clay powder is practically cohesionless; add water and at a certain moment cohesion will reach a maximum; when water is added in excess, the cohesion decreases.

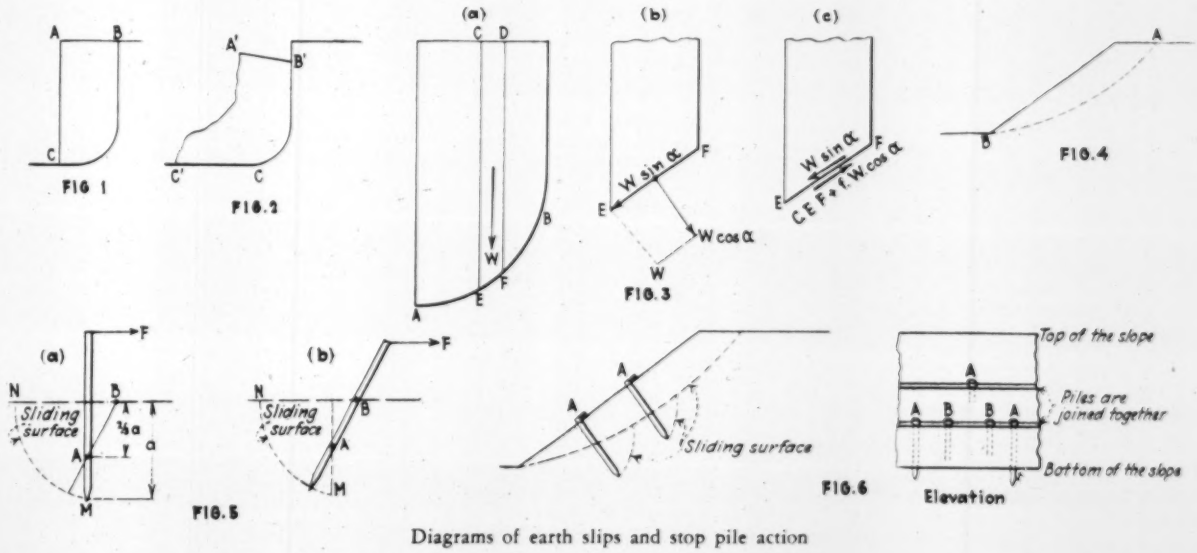
The logical procedure is, by draining the soil, to dry the clay until it reaches its maximum of cohesion. Good drainage is the first preventive against landslides.

A second preventive, which, so far as the writer knows, has not yet been applied, is the following: The total sliding resistance depends on *(a)* the value of the elementary sliding resistances on each element of the sliding curve, as stated by the above formula; and *(b)* the number of such elements, or the length of the sliding arc AB (Fig. 4). Therefore, increasing the length of the sliding arc might be considered another preventive against landslides. If the arc itself cannot be lengthened, compensation might be sought elsewhere.

Consider the behavior of a pile under the action of a force perpendicular to its direction. The writer began his experiments thereon in Moscow, Russia, and is now proceeding with them at Yale University, in cooperation with the Connecticut state highway department. The pile loaded normally to its direction at first turns about a point A, located on the pile itself approximately $\frac{1}{4}\,a$ deep, where a is the total depth to which the pile has been driven (Fig. 5). Afterward, at a moment near the destruction either of the pile or of the soil, the center of rotation moves approximately to B, so that the eventual sliding surface of the lower point of the pile is the line MN.

Therefore, in order to increase the sliding resistance of a slope it seems adequate to bore deep holes in the slope (not at its foot, but higher) and either fill the holes with concrete or introduce ready-made concrete or wooden piles into the holes (Fig. 6). Obviously, the piles should fill the holes tightly; and they should not be short, lest they slide down with the earth. In order to hold the sliding mass more securely, secondary piles B or even short sheetpiles might be applied. These would not need to be so long as the principal piles, A.

Piles and sheetpiles are used in landslide regions, but their purpose is to hold earth already in movement; they are driven at the foot of a slope and sometimes actually represent retaining walls.



Diagrams of earth slips and stop pile action

Erecting a 750-Ft. Steel Arch Without Falsework

Contractor utilizes cable tiebacks and temporary cable-bent towers to build each half as a cantilever arm on Croton Lake structure in Westchester County, N. Y., longest three-hinge design on record

By W. FREDERICK WELSCH
Division Engineer, Western Division, Westchester County Park Commission
Pleasantville, N. Y.

THE NEW steel arch over Croton Lake in northern Westchester County, N. Y., is the largest of the many bridges in the county's extensive highway system. It is also believed to be the longest three-hinged arch yet built. In addition to features of architectural and technical interest, it was erected by a cantilever method involving the use of temporary cable tiebacks, utilizing hydraulic-jack adjustment. The bridge is 750 ft. c. to c. of end pins, 44 ft. c. to c. of trusses and carries a 40-ft. roadway and a 6½-ft. sidewalk on each side. The bottom chord has a parabolic outline with a rise of 125 ft. The bridge required 1,400 tons of carbon steel, 600 tons of silicon steel, 60 tons of cast steel and 300 tons of reinforcing steel.

The location of the bridge on the new Bronx River Parkway Extension is shown in Fig. 2. Croton Lake is a part of New York City's water-supply system and is located in the foothills of the Catskill Mountains. Because of the topography of the surrounding country a monumental structure was desirable, and the steel arch was selected as best meeting this requirement. Conditions at the site also were somewhat unusual and influenced both the character and the erection of the superstructure. The parkway crosses the lake at its narrowest point, the distance between shore lines being about 700 ft. at normal water level; the water is about 90 ft. deep for a large part of the width. This latter condition dictated a single span, and the desired alignment of the parkway brought the span length to 750 ft. The possibility of some settlement of the north abutment made a three-hinge design advisable.

The monumental character of the abutment design is indicated in Fig. 1, on achitect's wash drawing. These abutments as well as the flanking spans on the approaches are of concrete, unfaced, but with accentuated formmarks (Fig. 4). All pilasters and columns in the abutments are precast concrete blocks, and the concrete blocks for the balconies are made of cast stone of approximately the same color as the wall concrete.

Design

At the south abutment, rock is very close to the surface, but near the north abutment it is from 80 to 150 ft. below the water, rising toward the north and overlain with sand, gravel, clay and boulders. The latter material, however, was so densely compacted that it was deemed suitable for foundation material. During excavation the dense character of the material shown by the borings was verified. Indeed the sides of the excavation remained vertical enough to be utilized as forms against which the abutment concrete could be poured.

Although the material at the abutment sites was found to be satisfactory, the possibility of a slight settlement of the north abutment indicated the desirability of a three-hinge arch, as a small movement of the supports of this type of bridge does not alter the stresses as it would with a two-hinge type. Freedom from temperature stresses and from the delicate adjustment at closure are additional advantages of the three-hinge design. The effect of a range of 100 deg. in temperature on this structure was estimated to move the crown pin vertically only 10 in.

Fig. 1—New Croton Lake crossing of Bronx Parkway Extension in Westchester County, N. Y.

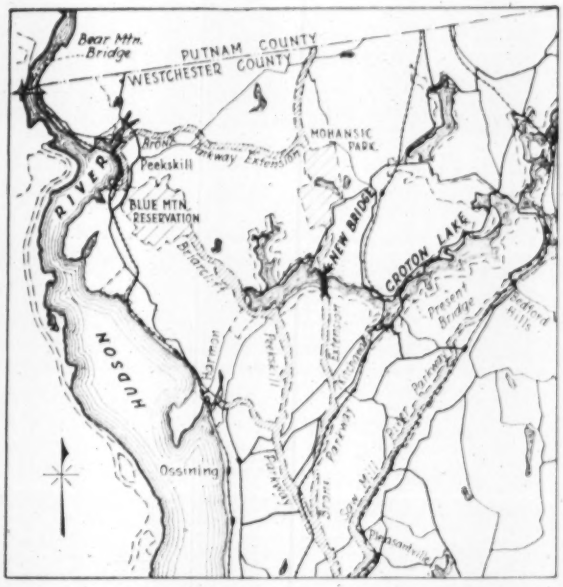


Fig. 2—Upper Westchester County, showing location of new Croton Lake crossing

the bottom chord of the arch, and anchorages at the ends of the span, where the reactions are taken by the transverse bracing and carried to the bearings. The chords of these cantilever trusses are supported at the ends of the floor beams and pass outside of these members, so that they extend from end to end of the span, interrupted only at the two expansion points. In designing the floor a 20-ton truck was assumed in each lane of traffic with a live load of 100 lb. per sq.ft. on the sidewalk.

The bridge is exposed to the effect of violent storms, and the bracing was designed for a wind pressure of 50 lb. per sq.ft. of exposed surface on both arches, together with an additional allowance for exposed surface of bracing. The bracing is so designed that the wind pressure from the top chord will be carried by frames to the bottom chord, and the bottom chord laterals are proportioned to carry all wind loads to the abutments. The laterals of the top chord are proportioned to provide proper stiffness to the chord as a compression member.

Erection

The erection of the steel superstructure presented several difficulties. The depth of the water and the steep slope of the lake bottom for over 100 ft. out from each

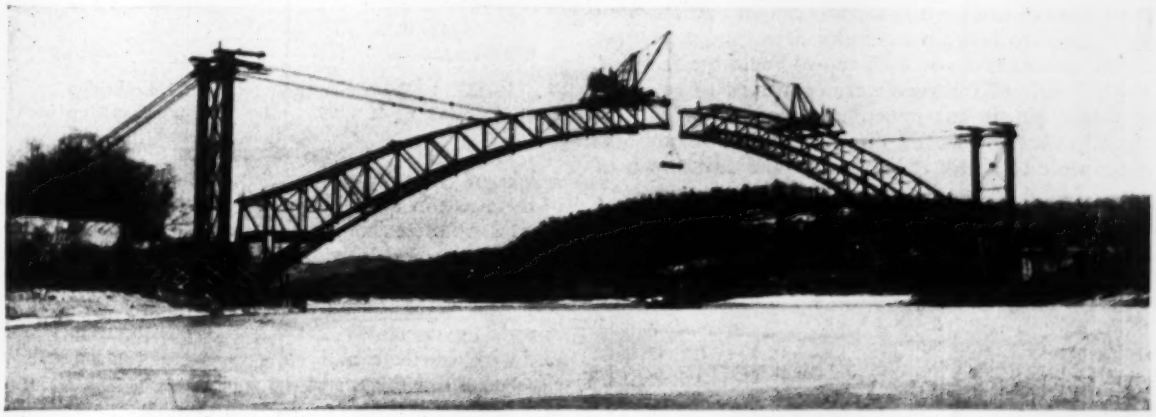


Fig. 3—Deep water and presence of water-supply aqueduct under bed of lake dictated adoption of cantilever erection without falsework

The curve of the bottom chord was made parabolic. Consequently, for a uniformly distributed load over the entire span there would be no stresses in the arch outside of this member, the top chord and web members being stressed only from live loads unevenly distributed and from minor variations in the dead load. The bottom chord being the main stress-carrying member, it was found economical to design it in silicon steel. Other members are of carbon steel rolled to special specifications.

The floor, for the greater length of the span, is suspended from the arch but crosses the bottom chord at the second panel point from each end. A reinforced-concrete slab, continuous from curb to curb, rests on 18-in. I-beam stringers carried on top of the floor beams, this arrangement providing easy installation of forms for the floor slab and accessibility for inspection. Two main expansion joints are provided in the floor 100 ft. from each end of the span.

The floor has its own lateral system, designed as a horizontal cantilever with hinges at the expansion joints, fulcrums at the two points where the floor intersects

abutment made the use of ordinary falsework impracticable; the use of steel cylinder piers was not advisable because of the difficulty of securing good footings. Another objection to supporting the arch from the bed of the lake was the uncertainty as to the location of the old Croton aqueduct near the south end of the bridge. This aqueduct, which carries part of New York City's water supply, is buried only a few feet beneath the bed of the lake; and since an injury to it would be serious, it would have been necessary to make a subaqueous excavation to locate the aqueduct before placing bents for the support of the arch.

The plan finally chosen involved a system of tie-backs and heavy concrete anchorages buried in the earth some distance back from each end of the bridge. From these anchorages the cable tiebacks were connected to three points on the top chord of the arch (Fig. 5). The first tieback ran from the anchorage direct to point U_6. The other two ran from the anchorage to the top of a 147-ft. cable-bent tower, supported on the arch abutment, from where forestay cables ran to points U_2 and U_8. The tower was designed to rock in the plane of the cables

(by machining the base of the tower to a radius equal to the height of the tower) so as to avoid bending stresses. Each half-arch was erected as a separate operation, with closure at the center. Steel was erected with two steel travelers, each equipped with a stiff-leg derrick and steam hoisting engines.

Erection Towers—The cable-bent towers were built from the floor beams of the bridge. There were two pairs of posts in each tower, and each post was made up of three floor beams on end, one on top of the other. A special structural-steel base and top were fitted to the ends of these lines of floor beams. Each pair of posts was laced together with angles to form a tower leg; and floor-beam hangers, which were made of four angles, battened, were used as bracing between the legs.

Since there was no material in the floor system of the bridge suitable for use as tiebacks, $2\frac{3}{8}$-in. diameter galvanized-steel bridge cables were used. These cables had an ultimate strength of 256 tons each, were pre-stretched at the factory to take out the construction stretch and were socketed to length under the maximum tension that they would receive when in use. Adjustment of cable length was accomplished by the use of a hydraulic pulling jack, which pulled each cable separately. All the cables in a group were pulled to a certain reading of the gage on the pump jack, and the distance that the socket pulled away from the cast-steel block was noted. Shims were then inserted to take up the inequalities, and a new set of readings was taken on each rope. From the fact that the other ends of the rope were connected to equalizer plates on a pin, it was sometimes necessary to go over these adjustments two or three times before uniform stresses were obtained. The erection and adjustment of

Fig. 4—Accentuated form-marks decorate faces of concrete abutments and approach spans

these cables proved to be tedious and very expensive.

The towers were placed symmetrical with respect to the span. This was not possible with the anchorages, and at the north end the anchorage was placed relatively close to the tower in order to avoid interference with a road that ran parallel to the lake shore. At the south end of the bridge it was desired to erect a concrete approach arch before the erection of the main span. The south anchorage, therefore, has to be placed far enough back so that the first-stage cables would clear this work.

Both north and south anchorages consisted of a block of concrete 15 ft. high, 20 ft. wide and 60 ft. long, reinforced along the bottom and the vertical side farthest from the bridge with $\frac{3}{4}$-in. square bars, $8\frac{1}{2}$ in. on centers. Embedded in this concrete block were 6-in. eyebars, one group on the center line of each truss, the bottom end of these eyebars coming to the lower rear corner of the block of concrete. The upper ends of the eyebars came above the subgrade of the roadway and were connected by a pin to a structural-steel shoe that rested on top of a structural-steel bent. The same pin connected them also to the plate hitches of the backstay cables. The structural-steel bent at this point was necessary to take the vertical reaction of the first-stage cables, which were not in line with the direction of the eyebars.

In designing the concrete anchorages the following assumptions were made: weight of concrete, 140 lb. per cu.ft.; backfill over anchorage, 90 lb. per cu.ft.; weight of undisturbed earth, 100 lb. per cu.ft.; bearing pressure on undisturbed earth, 4,000 lb. per sq.ft.; pressure on vertical side of anchorage against undisturbed earth, 4,000 lb. per sq.ft. at bottom of anchorage and 0 at the surface of ground. The friction of concrete on earth was assumed at three-tenths of the net downward

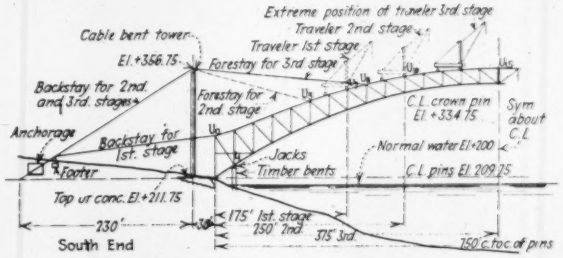


Fig. 5—Erection diagram, Croton Lake bridge
Closure was made at L_{15}. Erection procedure on both arms was similar.

weight of the concrete—that is, the vertical component of the stress in the cables was deducted from the weight of the concrete before figuring the friction. These anchorages were designed for a factor of safety of 2.

Erection Procedure—After the general dimensions and location of towers and anchorages had been determined, the weights of the steel in the arch trusses, exclusive of floor and hangers, were computed from the design drawings, and the concentrations at the upper and lower panel points were figured. The weight of the traveler was estimated to be 70 tons, or 35,000 lb. on each of four wheels, the spacing of the wheels along the truss being approximately one panel length. The stresses in the cables and towers were computed analytically for the three stages of erection. The first stage covered the panels from U_0-L_0 *to* U_7-L_7, with the arch supported by backstays attached at U_0. The second stage continued the erection from U_7-L_7 to U_{10}-L_{10}, with the truss supported by backstays at U_5. The third stage covered the erection of the remainder of the half-truss, with the truss supported by the backstays at U_8. This three-stage erection was necessary because the top chord was not heavy enough to carry the truss and traveler as a cantilever for more than seven panels. It was found that the erection stresses in three of the web diagonals—namely, U_8-L_9, U_9-L_{10} and U_{10}-L_{11}—were excessive for carbon steel, and these three members were made of silicon steel.

The topography at the north end of the bridge was such as to make the handling of heavy steel pieces very difficult. At the south end of the bridge, however, there was a roadway along the shore of the lake only a few feet above the level of the water, so that it was decided to haul all material from the railroad station (a distance of $3\frac{1}{2}$ miles) to this end of the bridge. A stiff-leg

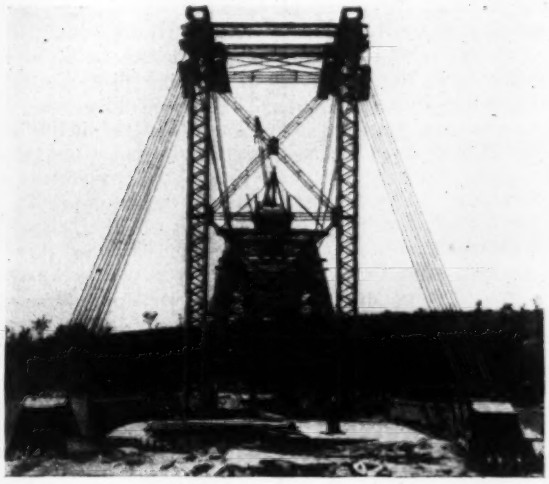


Fig. 6—Backstay cable anchorage and cable-bent tower

derrick was erected in such a position that it could unload the steel from the trucks as they arrived and store it in the small space available at this point. The derrick also was so located that it could place the steel on barges for transportation to the point where it was needed in the bridge, although the severe drought of 1930 caused the water in Croton Lake to fall to such an extent that a second derrick was later required to reach the barges.

Two timber barges 45 ft. long, 22 ft. wide and 4 ft. 3 in. deep were decked over tight so as to prevent possibility of being swamped by waves when loaded. At one end of each barge a two-drum gasoline hoisting engine was installed, the steel cable from one drum being attached to the south shore and that from the other drum to the north shore of the lake. By properly locating the anchorages of these cables the barge could be brought to any desired position. Each barge had sufficient carrying capacity to accommodate all the steelwork of one panel of the arch.

The procedure for erecting the steel was as follows: one of the travelers with a 145-ft. boom was assembled on the south shore and erected the cable-bent tower, which was held in place by temporary guys. Working through the tower, the traveler then set the first two panels of the truss, using the arch shoe and a temporary timber bent at L_1 as supports. The first-stage cables were then stretched between the anchorage and the hitch at U_0, using a heavy hydraulic jack on top of the timber bent at L_1 under each truss to raise the truss sufficiently to connect the backstay cables. The second traveler was then erected on top of the top chord. The jacks then let the truss down so that the load was taken by the backstay cables, and the timber bents at L_1 were released.

The erection of the trusses was then continued, using the cantilever method, to U_7-L_7, at which time the traveler was moved just far enough beyond U_5 to allow the auxiliary boom that was placed on the rear of the traveler to erect the hitch material at U_5. One group of four cables was then attached between U_5 and one of the links at the top of the tower. There were two of these links for each truss spaced 5 ft. on centers, symmetrical about the center line of the truss. After these cables were attached and adjusted the 400-ton jack in the link picked up the load of the truss so as to release the cables from the hitch at U_0.

The second stage of the erection then proceeded to U_{10}-L_{10}. At this point the traveler was moved forward just enough to allow the erection of the hitch material at U_8. Four cables were now attached from the hitch at U_8 to the other link at the top of the tower. After being adjusted the jack in this link picked up the load so as to slack off the cables at U_5. These cables were lengthened by attaching additional cables of the same size. This second group of four cables was then adjusted and the load divided between the two groups of cables, the stresses being determined by the reading of the dials on the hydraulic pumps.

By the time this point was reached the north abutment was ready to receive steel. It was deemed advisable to stop work on the south side until the erection of the north side was brought up to a similar stage. Then with steel in place out to L_{10} on each side, both arms were erected simultaneously until they met at L_{15}. They were then carefully lowered by the jacks in the forestays until the two half-arches came to a bearing on the center pin at L_{15}.

The travelers were then removed from the top of the trusses, the towers dismantled by the use of the 145-ft. boom, and the hangers and floor system were erected by using runner lines from hoisting engines placed at each end of the bridge, these lines passing over sheaves attached at the panel point of the truss where the steel was being erected. The eyebars of the anchorages were burned off below the subgrade of the roadway; the concrete anchorages were left buried.

All the steelwork of this bridge was assembled in the shop and reamed and match-marked. The trusses were cambered for dead load, the camber being figured along the center line of the chords. However, the depth of the bottom chord was so great that, when the trusses were assembled in the shop with this camber, it was found that the bottom of the joints were slightly open. It was decided to ream and match-mark all members of the trusses in this position except the bottom chord. The trusses were then taken down and the bottom chord reassembled so as to get a full bearing for the entire depth of the joints. These joints were then reamed and match-marked. When the work was erected in the field the same opening at the top of the bottom-chord joints existed until the arch was closed, and the dead load was carried by the bottom chord. For this reason the joints of the bottom chord were bolted until after the arch was swung. Riveting of all other connections was carried forward as the work was erected.

The method of erection and the falsework materials were designed by the Mount Vernon Bridge Co., of Mount Vernon, Ohio, under the direction of J. K. Lyman, assisted by the late Russel Vaughan and approved by Howard C. Baird, consulting engineer, New York City, who designed the bridge. The steelwork was fabricated and erected by the Mount Vernon Bridge Co. The concrete anchorages were constructed by the general contractor, the P. T. Cox Contracting Co., New York, P. T. Cox, president, W. T. Fitzpatrick, chief engineer, and A. J. Foote, superintendent.

The Bronx Parkway Extension is under the administration of the Westchester County Park Commission, Jay Downer, chief engineer, L. G. Holleran, deputy chief engineer, Gilmore D. Clarke, architect. The writer was in charge of field engineering and construction, and Samuel Rosenberg was resident engineer.

Black Concrete Pavement Laid on Street in Residential Section

By G. R. HARTLEY
City Engineer, Englewood, N. J.

UNDER SOME circumstances, especially in residential areas, the color of pavement surface has been the deciding factor in the selection of the type to be used. Heretofore, where a dark surface was desired, an all-concrete slab has been at a disadvantage. During the season of 1929 a concrete pavement with its surface darkened by the use of 2 lb. of black iron oxide per sack of cement in a 2-in. top mixture was used on Franklin St., Englewood, N. J. As a result of this experience, the possibilities of securing a still darker color were realized. Black concrete was considered and finally adopted as the type of pavement to use on Glenwood Road, which extends through a high-class residential section of the city. The black surface was desirable to match the color of bituminous pavements on adjoining streets and private driveways.

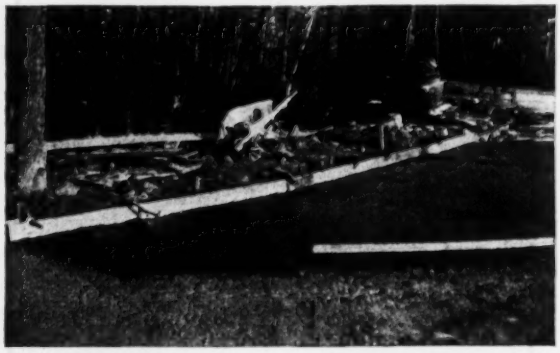
The completed pavement gives a very pleasing effect, the color being quite similar to that of adjacent bituminous pavements, or perhaps more nearly that of dark-colored trap rock. Since its completion the project has attracted widespread attention as to possibilities of similar applications in other residential sections, parks and localities where color is given special consideration.

From experience elsewhere it was apparent that the use of 8 lb. of iron oxide per sack of cement would give the desired color. In order that the cost for the coloring material might be reduced to a minimum, the pavement was designed for a 1-in. top consisting of a 1 : 1½ : 2 mixture, using ½-in. graded stone and the iron oxide admixture. A thickness of 6 in. was used for the base course with a 1 : 2 : 3½ mixture, using ¾-in. graded stone. The specifications provided for aggregate meeting the requirements of the New Jersey state highway department.

Steel fabric, weighing 59 lb. per 100 sq.ft., was placed 2 in. from the bottom of the slab. The mixing time was specified as 1½ min. for the base and 2 min. for the top-course concrete, the longer time in the latter case being allowed for proper distribution of the coloring pigment throughout the mixture.

The construction of the two-course pavement was similar in every respect to that for a monolithic type and was as follows: A 2-in. layer of concrete was placed on the subgrade, the steel fabric was then placed in position, and the remaining 4 in. of base course placed, followed immediately by the 1-in. top course. Both types of concrete were mixed in the same paver, and the work was completed as the mixer moved forward, thus insuring a truly monolithic slab.

An integral concrete curb was constructed at the same time, backed up with a base concrete and faced and topped with the black concrete mixture. The pavement was constructed in two 15-ft. slabs, using ⅝-in. premolded joint filler in the center joint and also in the transverse joints, which, spaced at 45-ft. intervals, extended through the curbs. The consistency of the base course was stiff enough to resist displacement when the top course was deposited. The consistency of the top course was also quite stiff. Screeding and finishing of the surface were performed with hand tools. Final finish was obtained by brooming transversely.



Iron oxide mixed with cement makes a black surface on Englewood, N. J., street

Spreading top layer of black concrete over regular concrete base

As soon as the surface was sufficiently hard to permit, a 6-in. layer of hay was spread over it and wet down. This was kept wet for a period of ten days.

The specifications for the iron oxide provided that from 95 to 97 per cent should be pure iron oxide and ground to such a fineness that not less than 96 per cent should pass a 325-mesh sieve. The aggregates were measured by weight at a central proportioning plant. The iron oxide was added at the mixer skip with the other ingredients for each batch.

Tests of materials, including the concrete, were made during the progress of the work, and a summary of such

SEVEN DAY TENSILE STRENGTH TESTS

	Lb.
Neat cement briquets	656
Neat cement with 8 per cent iron oxide	660
Mortar (1:3)	321
Mortar (1:3) with 8 per cent iron oxide	321

28-DAY COMPRESSIVE STRENGTH TESTS, 6x12-IN. CYLINDERS

	Lb.
Base course (1:2:3½)	4,314
Top course (1:1½:2) with 8 lb. iron oxide	4,885

FIVE-DAY COMPRESSIVE TEST

	Lb.
Base course (1:2:3½) cured outside, temperature 12 to 35 deg. F.	1,678
Top course (1:1½:2) with 8 lb. iron oxide	2,167

MODULUS OF RUPTURE

(1:2:3½ base and 1:1½:2 top with 8 lb. iron oxide per sack of cement) 6x6x36-in. beams (4-in. base and 2-in. top).

	Lb.
5 days	450
14 days	890
28 days	1,083

tests is shown in the accompanying tabulation. Comparative tests indicate that the strength of concrete was not affected by the use of this quantity of iron oxide.

The project consisted of 4,150 sq.yd. of 7-in. concrete and was constructed in November, 1930, by the Joseph Kinzley Co., of Hackensack, N. J., at a contract price of $2.50 per square yard. Plans and specifications were prepared by and the work was performed under the supervision of the writer.

Cuyahoga River to Be Widened at Bends

Straightening discarded after many years' study of improvement plans—Conservative project adopted

AFTER some twenty years of study and discussion of plans for straightening the sharp bends of the Cuyahoga River through the congested industrial valley region of Cleveland, city authorities have finally discarded all such plans and have adopted a simple plan under which the river is to be widened at bends and at narrow points to pass ore ships 600 ft. long. The plan was worked out by Robert Hoffmann, consulting engineer to the city's department of public service. Improvement of similarly conservative character was outlined by Charles Keller in a report to the Cleveland Chamber of Commerce a year and a half ago. Mr. Hoffmann's plan was adopted by the city council in January. Work on its execution is expected to start soon.

Earlier plans contemplated radical straightening by digging new channels across the bends and abandoning the present course of the river. The most complete plan of its kind (*ENR*, May 16, 1919, p. 73) contemplated a straight channel from the river entrance to the arch span of the Detroit-Superior bridge, thence deflecting slightly to the east to form a practically straight line in cutoffs across four successive meanders of the river. As the valley plain is fully occupied by industrial and commercial establishments and railroad trackage, such improvement meant virtually complete reconstruction of the entire valley area. Subsequent construction of the new river crossing of the Cleveland Union Terminal Co. and construction of the Lorain Ave. viaduct tended to limit channel changes, and this with the great cost of straightening made a simpler solution preferable.

Federal participation in Cuyahoga River improvement to the extent of $400,000 was provided for in the river and harbor act of 1917. Last November the voters of the city authorized a bond issue of $3,250,000 for the work. The present plan, prepared in response to this vote, has been approved by the city council and the war department. Present expenditures on the project will be limited to the $3,650,000 city and federal funds available. The final cost will approach $6,000,000.

The Cuyahoga River through the industrial valley of Cleveland is to be made navigable for large ore ships by widening the river at narrow points and bends instead of by a series of cutoffs, as previously planned

The Cleveland Union Terminal viaduct and the Lorain Ave. viaduct were built after this photograph was taken.

Experience With Girder-Beam Bridges in Georgia

By SEARCY B. SLACK
Bridge Engineer, State Highway Board of Georgia, Atlanta, Ga.

THE introduction of the heavier and deeper (30-, 33- and 36-in.) steel beam sections has opened up new possibilities in design of bridge spans with lengths of 50 to 100 ft. The use of these beams with concrete floor slabs and concrete stiffening diaphragms affords a very simple, easily erected bridge requiring no field riveting and in many cases practically no shop fabrication. A number of bridges of this type have been constructed on the state highway system in Georgia. The illustrations show several examples of various span lengths.

Beams Adaptable to Changes—The rapid development of highway traffic during the past few years has made it necessary to widen many bridges, and in some cases relocation makes it advisable to abandon a bridge that was considered permanent when built. It is difficult to anticipate just what developments will take place in highway traffic during the next few decades. Judging from past experience, it is advisable to build bridges in such a way that they can readily be widened or, in case location is shifted, that there will be a high salvage value of the materials used. The beam span can easily be widened and in case of change in location steel from the spans can be salvaged and re-used with very little loss.

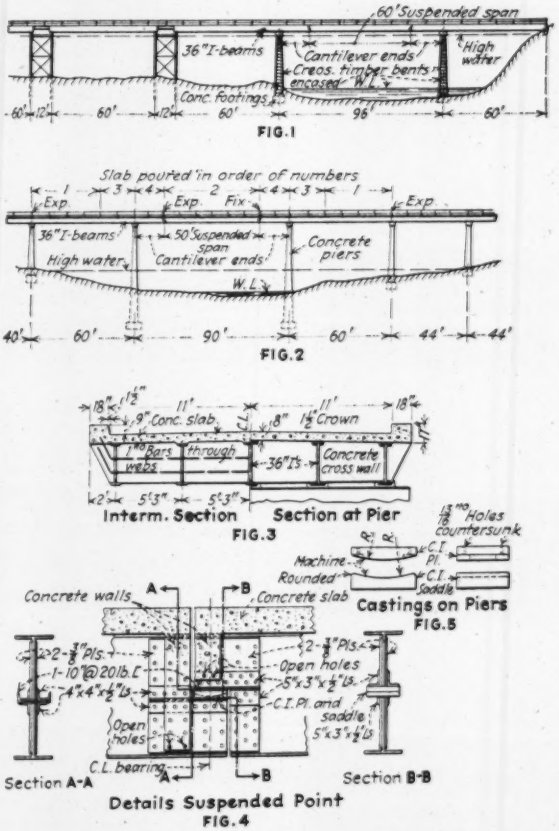
Recently before undertaking the construction of a bridge the Georgia highway department was notified by a power company that the proposed structure and its approaches would be some 15 ft. below future pond level of a power development. It was expected that this power development would be made within the next five to seven years. Highways leading to the bridge site had already been graded and temporary surfacing placed. To change the location so as to place the bridge above the future pond level would have required abandoning a little more than 2 miles of graded surfaced road, would have caused considerable delay in opening the road and would have required construction of a very high bridge much longer than could be justified at that time. Under these circumstances it was decided to build the bridge at the site that had been prepared but to use a type of construction that would afford maximum salvage in case power development materialized. The type of construction adopted involved a series of beam spans supported on double creosoted pine pile bents (Fig. 1).

Over the main stream a span of 96 ft. was needed to clear drift. This was worked out by cantilever beams and a suspended span as indicated in the drawing. When the permanent bridge is built at a new location the designs can be worked out very readily to utilize the steel beams in the present bridge, and the treated timber piles can also be salvaged for other uses. According to the experience of the L. & N. and the Central of Georgia railroads, the life of treated timber piles may be estimated at 25 years.

Details—In more recent designs in Georgia it has been the practice to use castings for the end bearings of the beams. These castings are turned on a radius as shown in Fig. 5, and are used for the purpose of distributing the loads from the beams after the beams have taken dead load deflection. It is not considered likely that any movement between the castings will take place after initial movement caused by dead load. The lower casting is free to slide to provide for expansion. A detail of the beams at the ends of the suspended spans of Figs. 1 and 2 is shown in Fig. 4. The purpose of the channel in section *AA* is to prevent lateral movement of the beam, which is intended to slide on the bottom of the cast-iron saddle bearing on the web of the channel. On timber bents the loads from the beams are distributed by bearing plates secured by heavy lag screws.

In placing concrete decks for the cantilever beam spans a schedule of deck construction is worked out for each bridge. Typical division of the slabs is shown in Fig. 2. The sections are divided so that construction joints will occur at points of contraflexure and also over the piers where cracks through the deck may be expected. To prevent tension in the concrete floor slab in the case of cantilever spans, the top flanges of the beams over the piers are given a heavy coat of asphalt. This asphalt coat breaks the bond between the top of the steel beam and the concrete floor slab and will allow a slight movement between the floor slab and the beams.

The deflection of the beams under dead load is taken up by varying the distances from the bottom of the concrete slab to the top of the steel beam. The bottom of the slabs at the ends of the span are generally placed about ½ in. below the tops of the steel beams, while at the center of the spans the distance from the top of the steel beams to the bottom of the slabs will be varied to take up expected deflection. The deflections that actually occur are generally slightly less than the computed deflections, probably on account of the stiffening effect of the forms and of the concrete slab being placed in contact with the top flange of the beams. Manufacturers of the steel beams will bend the beams to any de-



Figs. 1-5—Georgia practice in girder-beam bridge design

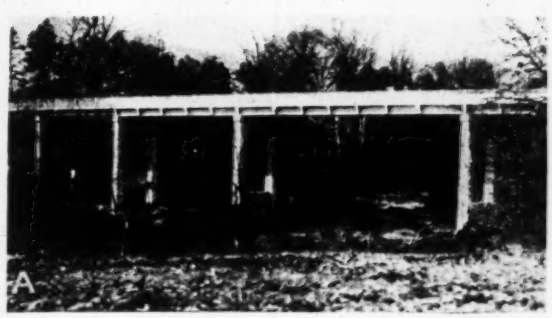


Fig. 6—Typical girder-beam bridges in Georgia

A—Barbers Creek Bridge, Clarke County. Spans, 60, 90 and 60 ft., respectively.
B—Little River Bridge, Columbia County; timber tower bents with 60-ft. beam spans between.
C—Walnut Creek Bridge, Bibb County, with 54-, 70- and 54-ft. spans.
D—Mulberry Creek Bridge, Jackson County; with 40-, 60- and 40-ft. spans.
E—Holly Creek Bridge, Murray County, with 52-ft. span on 30-deg. skew.

sired camber for a small extra charge. If the beams are bent the slabs can be carried at the same distance above tops of the beams for the entire length of the span. The deflections that have occurred in a number of spans have varied from ½ in. for a 60-ft. cantilever span to as much as 1¼ in. in a 90-ft. cantilever.

Lateral stiffness in this type of bridge is secured by concrete diaphragms between the webs of the beams and by rigid floor slabs fastened to the top flanges of the beams as shown in Fig. 3. The diaphragms between the beams on longer spans should be placed and allowed to set up before the concrete floor slabs are placed. If this is done a certain amount of lateral stiffness is provided before the heavy load from the floor slab is applied. If the diaphragms are placed before the floor slab, care must be taken to place the concrete in the floor slab in such a way that the deflection in all the beams of a given span will be nearly the same at all times, otherwise the diaphragms will crack.

Beams vs. Pony Trusses—A comparison of the steel weights of pony trusses with beam spans shows that the beam spans are somewhat lighter. This is especially true with the cantilevered or continuous beam span. The weight of structural steel for a simple beam span of 60 ft., with 22-ft. roadway, concrete floor designed for H-15 loading, and light concrete rail is 46,100 lb. This compares with 54,000 lb. for a pony truss span designed by the U. S. Bureau of Public Roads, having a 60-ft. span, a 20-ft. roadway and the same live load.

The weight of the structural steel for the main spans of the bridge shown in Fig. 2 consisting of two 60-ft. side spans and a 90-ft. main span with 22-ft. roadway was 171,200 lb. This compared with 199,000 lb. estimated weight for two 60-ft. and one 90-ft. pony-truss spans with 20-ft. roadway.

Painting—The final coat of paint generally used on Georgia beam bridges is tinted to match the color of the concrete, so that the general appearance of the finished structure is much the same as an all-concrete structure. The concrete floor slab protects the steel beams from the weather and there are no openings through the floor that would allow trash to drop on the flanges. Under these conditions unusually long life may be expected from the paint. The flat surfaces of the flanges and webs facilitate cleaning and painting.

Conclusion—Summarized advantages of beam spans are: (1) ease of erection; (2) ease with which bridge can be widened at any future time; (3) spans may easily be skewed; (4) high salvage value in case bridge is dismantled; (5) slight economy in weight of metal compared with truss span; (6) good appearance and ease of painting.

The main objection that has been raised to this type of construction is lack of rigidity and deflection of the span under load. Observations on the spans that have been built in Georgia indicate that these deflections are not serious and that they can be readily cared for during construction. Deflection under live load is minor. While vibration is quite noticeable, it may be minimized by a smooth surface on the concrete slab.

Small Sludge Bed More Efficient Under Lean-to Glass Inclosure

By G. E. WRIGHT
Principal Assistant Engineer, A. J. Foote Engineering Corp., Larchmont, N. Y.

WHEN increased sludge-drying capacity became necessary for the sewage-treatment plant of the unincorporated section of Mamaroneck, N. Y., a new bed was built and covered with a lean-to type of glass inclosure, so designed as to allow as many sun rays as possible to strike the surface of the sludge. Reflection was also utilized to the limit.

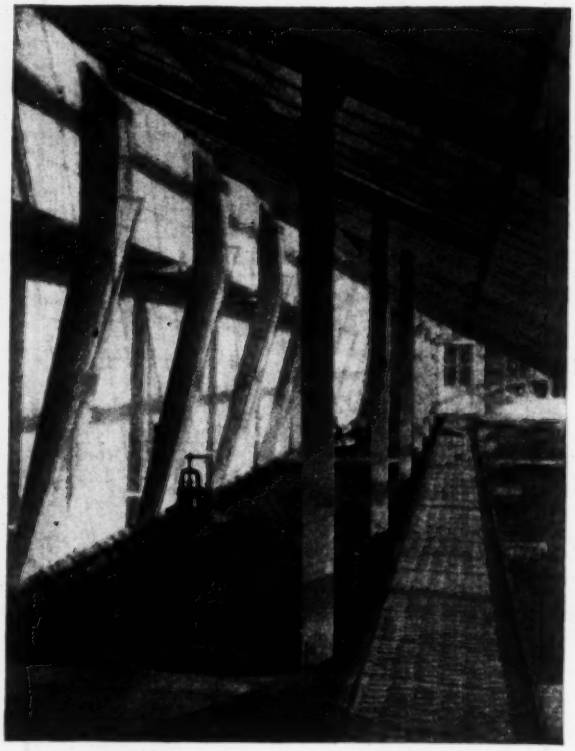
The existing glass-covered beds received 250 to 300 cu.ft. of sludge per day after a period of 50 to 60 days' digestion, and were being overloaded in times of cloudy or cold weather. The plant, which receives an average of 750,000 gal. of sewage daily, consists of a grit chamber, sedimentation tanks, sludge-storage tank, sludge digester and drying beds. The chlorinated effluent discharges into Long Island Sound.

The new bed is a concrete box 2½ ft. deep, 97 ft. long and 18¾ ft. wide and contains 19½ in. of filtering material. At 6-in. depth, found to be correct for proper drying, the desired capacity of 1,800 cu.ft. of wet sludge is obtained. This space was divided into three beds by 6-in. cross-walls. Under-drainage is provided by four grooves in the floor having a pitch of 4½ in. toward the front. They are capped with 6-in. split tile laid with open joints and connect to 6-in. discharge outlets. Over and around these drains is placed an 11-in. layer of 1½- to 2-in. broken stone.

The inside top corners of the side and end walls are chamfered to prevent a dense shadow along the walls. In the old bed it has been observed that where the walls or other structures cast an all-day shadow the sludge remains wet for a considerable period after the rest is dry.

The rear wall differs somewhat from the usual practice in sludge-bed inclosures. Instead of the A-shaped roof with glass on both slopes the lean-to type with only one slope is used. This bed faces almost exactly south, and therefore most of the sunlight enters from one side. It was thought best to allow as many rays to get into the structure as possible and then to reflect them back from a white surface onto the sludge, rather than let them pass on out through another glass wall, which would also radiate a large amount of heat. The hollow-tile wall holds this heat and reflects the sun's rays, thereby raising the temperature in the bed considerably. It has been observed in the short operating period that on a bright sunshiny day with a temperature of 20 deg. F. outside, the temperature within the inclosure (with the ventilators closed) is between 80 and 85 deg. F. There appears to be very little shadow anywhere in the bed. The reflected light is so strong that it hurts the eyes when one enters from the outside bright sunlight. Sludge is being dried in fifteen days in winter and from five to seven days in summer so that it can be ground.

The glazed inclosure is of the all-steel-and-glass type, with in-swinging ventilator sash in the front wall operated from the outside by a single handwheel at the mid-length. The columns and rafters are of 5-in. channel sections. The columns in the rear wall are made up of two 5-in. channels placed back to back to permit the 4-in. hollow tile to be set between the flanges. There is a door 3 ft. wide in each end.



Inside lean-to glass inclosure for Mamaroneck sludge bed

Glass cover faces south to intercept full period of sunshine. White back wall reflects rays, heating inclosures to 80 deg., with outside temperature below freezing. Note ventilating shafts on back wall and open-grating walkway between tracks for sludge dump-cars.

To prevent condensation on the under side of the glass and to keep the air in circulation, a ventilator composed of a manifold duct with branches extending down nearly to the surface of the sludge and up nearly to the glass at the top is supported on brackets along the rear wall, with its under side 6½ ft. above the top of the concrete wall. This duct is carried down and into the fan house, where it is connected to the existing blower. There is a damper in each intake controlled from the track walkway by a lever, so that air may be drawn from either the surface of the sludge or from just beneath the glass or both. When fresh warm sludge is emptied into the bed a considerable amount of vapor is released and tends to steam the glass. By switching the suction to the upper end of the intakes, this vapor is quickly drawn off and all the mist disappears from the glass.

The entire ventilation duct system is of 18-gage galvanized sheet steel. All metal within the sludge-bed inclosure is hot-dipped galvanized after cutting and punching, so that there will be no raw metal surfaces exposed. Ordinary window glass is used and fastened to the steel glazing bars with eccentric lead washers or lead clips and non-hardening putty.

Construction of the sludge bed was carried out by Kuchar Bros., at a low-bid price of $14,493.50, the largest item being $6,900 for the glazed inclosure. Construction was started Sept. 29, 1930, and the structure was completed Dec. 16. The entire job was handled with an average of eight to ten men, two tractor-mules, a 7-S concrete mixer and a small ½-ton truck. The A. J. Foote Engineering Corp. was the engineer. Charles S. Burrows prepared the design and had charge of construction under direction of the writer.

Water Development Provides Main Theme for Civil Engineers at Tacoma Meeting

Columbia River problems, irrigation and four hydro-electric projects occupy half of technical program—Structural and city planning divisions meet

(Engineering News-Record Staff Report)

PROBLEMS presented by the proposed development of the Columbia River—the Northwest's contribution to river problems of national importance—and descriptions of four local hydro-electric projects were outstanding features of the program at the summer meeting of the American Society of Civil Engineers at Tacoma, Wash., July 8-10. Two bridges, including the West's first modern suspension structure, were described at the meeting of the structural division, and the city planners considered street and traffic problems. Entertained by one of the youngest sections of the society, more than half of the 400 members and guests attending the meeting enjoyed an all-day boat excursion on Puget Sound, including a stop at the Bremerton navy yard, and many accepted the invitation for a motor trip over the recently completed Cushman No. 2 project of the city's hydro-electric system.

In the opening address President Stuart urged engineers to broaden their outlook and activities. He advocated participation of engineers in public affairs, urging them to use the same quality of thought on problems of public progress and human interest that they are accustomed to give to technical matters. Such efforts were considered essential in bringing due recognition to the engineer's importance in modern life.

Much of the address dealt with the railroads, their present problems, their importance to the country and the national necessity of maintaining them in a healthy condition. Pointing out the encroachments of various other transportation agencies and the grave slump in railroad revenues, he concluded that a general increase in freight rates was the quickest and most efficient aid that could be applied and that inequalities could be corrected later.

Ralph Budd, president of the Great Northern Railway and a recognized authority on Northwest history, described the development of the Puget Sound region, paying particular attention to the part played by the engineer. Practically uninhabited 50 years ago, this section has been developed almost entirely during the period of modern engineering accomplishments, and Mr. Budd traced the coming of the railroads, followed by the growth of irrigation, hydro-electric power and highways.

Columbia River

One entire technical session was occupied with consideration of the Columbia River and its possibilities. Speaking on this subject, Major John S. Butler, district engineer, Seattle, who is in charge of investigating the upper river as part of the study being made by the Corps of Engineers, outlined the immensity of the problems involved. For example, the average annual river flow for the entire basin is 146,000,000 acre-ft., or about ten times that of the Colorado. His statements were confined, generally, to a factual presentation of the problem, since results of the present investigations must await release of the official report. However, the questions involved in the development of the Columbia, he said, are primarily economic rather than engineering, and such factors as the disposal of power and the development of new irrigated areas are vital. Total storage possibilities are estimated at 14,000,000 acre-ft., considering the high (350-ft.) dam at Grand Coulee, which would provide about one-third of this total. Many dam sites have been drilled, but the present study can provide only preliminary estimates as far as individual units in the plan are concerned. Power sites on the tributaries alone would produce almost a million kilowatts 90 per cent of the time with stream regulation.

Both the proposed gravity and the pumping plans for bringing water to the 2,000,000 acres of irrigable land in the basin were outlined. The pumping scheme would involve lifting 16,000 sec.-ft. of water 400 ft. in plants of unprecedented size. However, only secondary power would be required, leaving a firm block of power available for sale.

Navigation problems to be considered involve only the lower river, where also are the principal questions of flood control. It is physically possible, however, to canalize the river all the way from the mouth of the Snake to the international line. The three-year study now almost completed has been made with complete cooperation of all governmental agencies and has taken due consideration of international questions.

Discussing irrigation phases of the Columbia River development, Ross K. Tiffany, consulting engineer, Olympia, outlined at some length the predicted growth in the Western states to indicate that continued reclamation is justified. A population in the eleven Western states of 25,000,000 was estimated by 1960. To meet this growth Mr. Tiffany foresees the need of using the large area of irrigable land in the Columbia River drainage basin. Prior development in this area has been uniformly successful financially; three of the major federal projects have repayment records of about 97 per cent.

The 4,000,000 acres of irrigable land on the Columbia River and its tributaries, in the opinion of Mr. Tiffany, should be programmed for a continuing development of from 30,000 to 100,000 acres annually. Such conflicts in interest as would arise between irrigation and power should be reviewed by state and federal authorities and rulings made that would put the stream to the highest beneficial use. Considering the complex international questions involved, it is advisable to begin the study of this phase at once. The present general report of the Corps of Engineers should be supplemented by detailed investigations by state authorities for the purpose of reaching interstate agreements and coordinating the development program.

Discussion by J. C. MacDonald, comptroller of water rights, British Columbia, foresaw no difficulty from overproduction coming from such a program. He believes that settlement problems can be eliminated by progressive development and care in excluding areas of

marginal value. He spoke of the necessity for international cooperation in any program and hoped that it will be more active than past experience indicates.

J. Jacobs, consulting engineer, Seattle, classed the Columbia as the largest national river problem, with the exception of the Mississippi. He stressed the need for creating a Columbia River Commission, composed of representatives of the basin states and the government, to study the broadest phases of the question and guide the development.

Other speakers urged immediate action on the problem in the interest of the region as a whole and of certain distressing local conditions among farmers in the basin area. It was significant that no speaker ventured to state a preference for either the gravity or the pumping plan, although both were referred to. Apparently, all prefer to await the findings in the army engineers' report.

Irrigation Problems

A paper on the use of treated timber in irrigation structures by L. M. Grant, sales engineer, West Coast Wood Preserving Co., Seattle, pointed out the desirability of keeping first costs low in irrigation development to relieve carrying charges while the land was being brought into bearing. The ultimate economy of so-called permanent construction often is not possible, although increasing the life of structures with reasonable additions of cost is desirable. The balance between these two factors prescribes conditions particularly suited to the use of treated timber. Pressure creosoting, although about doubling the cost of the timber, produces an estimated life of from 30 to 40 years. For such structures as wood-stave pipe lines, semicircular flumes and head works, this material combines the quality of low first cost, which has made timber so important in irrigation development, with a life expectancy that materially reduces annual charges.

In discussion Augustus Griffin, superintendent of operation and maintenance, department of natural resources, Canadian Pacific Ry., agreed as to the importance of reasonably low first cost on irrigation development and considered treated timber a material of great value for this type of construction. After careful investigation it is being used almost exclusively on C.P.R. projects under his charge. It is of particular importance in that region because the alkali content of the soil has proved highly injurious to concrete; a concrete siphon barrel was so badly deteriorated within five years after building that it required removal. Treated timber was used for replacement and has shown no evidence of trouble. Some remarkable records on other projects were mentioned where treated wood had been in use under extreme conditions for periods of from ten to fifteen years without appreciable maintenance.

"Use of Models for Predicting Flow Through Hydraulic Structures," a paper presented by J. C. Stevens, consulting engineer, Portland, brought out the fact that true similitude between model and prototype is difficult if not impossible in this type of model work. Such factors as force of gravity, atmospheric pressure, viscosity and surface conditions cannot be definitely reduced to model proportions as can linear dimensions. However, it is possible to calculate the amount of variation in these factors and apply corrections. Further, it is possible to calculate the expected behavior of models under test and if such predictions are correct, it is reasonable to assume that calculations in the behavior of actual structures are correct. He outlined briefly the nature of the relations used in conversion factors and mentioned the difficulty in correcting for fluid friction and surface roughness in model reductions. The use of models in this work was predicted as only in its infancy and already proving a great benefit to hydraulic engineers.

Prof. M. P. O'Brien, University of California, in discussion, referred to the seriousness of errors that may occur in model work, incuding the magnification of measurements, and observed that the smaller the model the greater the magnification of the error. He described briefly the model tests made recently in connection with the proposed salt water barrier across upper San Francisco Bay, which demonstrated the effect of salt water flow during the operation of locks in such a structure.

Hydro-Electric Projects

Construction of the Rock Island project on the Columbia River was described by W. D. Shannon, general superintendent, Stone & Webster, Seattle. River diversion problems in a stream with an average flow of 120,000 sec.-ft., and the speed of construction were outstanding features. The timber crib cofferdams were described in *Engineering News-Record*, April 30, 1931, p. 716. Differing from the usual type of Western power project, this is a low head (52 ft.) plant using a large volume of water. The main structure consists of a dam and power house with a total length of more than 2,000 ft. and a maximum height of 107 ft. From the start of the diversion work in January, 1930, this structure has been completed and will be ready for operation this fall. The plant is designed for an ultimate installation of twelve 21,000-hp. units; four will be installed now.

The Ariel project, including special features of the 313-ft.-arch dam, were described in a paper by Lyman Griswold, consulting engineer, Portland. This structure was the subject of an article in *Engineering News-Record*, March 12, 1931, p. 435.

An outline of the municipal power project of Seattle on the Skagit River was presented by T. H. Carver, in charge of water supply and power development, emphasizing the Diablo Dam, which was described in *Engineering News-Record*, Aug. 29, 1929, p. 320.

Tacoma's Cushman No. 2 plant was discussed by Verne Gongwer, superintendent, hydraulic design and construction. The development consists of an arch dam 240 ft. high, a 17-ft. pressure tunnel 13,000 ft. long through gravel and penstocks delivering water under a 475-ft. head to a power house located on tidewater. The most unusual construction feature was the tunnel lining operation using a special form that permitted pouring the entire circular section without longitudinal joints. This equipment and operation were described in *Engineering News-Record*, Oct. 16, 1930, p. 610.

Two Important Bridges

The 800-ft. cantilever type steel arch bridge across Lake Union, Seattle, was described in a paper by T. G. McCrory, chief engineer, state department of highways. This fixed structure connects important districts in the city now served by four smaller movable bridges. Deck type of construction throughout includes the main span and 2,155 ft. of approaches; the clearance is 135 ft. The two main piers rest on 1,476 timber piles driven inside of steel sheetpile cofferdams. Piles were driven by compressed air to a depth of about 45 ft. under water, cut off and the pier bases poured by tremie from a float-

ing concrete plant. These seals were poured continuously, using eight tremies located to cover the area of the cofferdams without lateral shifting.

Steel erection was started on the flanking spans with guy derricks placed on top of the anchor piers. A frame derrick traveler erected the remainder of the main structure. The bridge is a joint city, county and state project, designed and built under the direction of the state highway department. The total cost, exclusive of right-of-way, is $2,400,000.

The St. Johns bridge, notable as the first modern suspension bridge on the Pacific Coast and because of its unprecedented use of wire rope cables on a 1,207-ft. span, was described by D. B. Steinman, Robinson & Steinman, New York, designers of the structure. Design features, including the extensive use of the pointed arch motif, were described by Mr. Steinman in *Engineering News-Record*, Feb. 13, 1930, p. 272.

Foundation for the east tower pier consists of 1,068 timber piles; the west pier rests on rock. Wooden cylinders 75 inches in diameter were placed in each main pier as fillers to save concrete. Main tower erection (*ENR*, Nov. 13, 1930, p. 770) was carried on by means of timber falsework towers 300 ft. high from which a stiff-leg derrick set all the tower steel without a change in position.

The principal feature of the cable erection was the elimination of the usual footwalk and use of an overhead system of tramway lines and track ropes. The track ropes were stationary and were used to support the steel cages for the men. Stringing the two cables, consisting of 91 1½-in. strands each 2,750 ft. long, pretested and socketed to exact length, occupied 40 days. Suspended steel was hoisted from barges by falls attached directly to the cables. Pouring of the 2,000 ft. of suspended floor span slab 40 ft. wide was done in eight days using transit-mixed concrete.

City Planning Division

A paper discussing the bypassing of traffic around small towns, by E. E. East, chief engineer, Automobile Club of Southern California, urged such a measure whenever congestion of traffic reaches a point where travel or business suffer. Local public sentiment may be expected to oppose any such proposal, even though the engineer can prove it entirely justified. Such a minority attitude is unsound, however, for it forces the expenditure of public funds in a manner that results in inconvenience to the majority. Further, recent surveys have resulted in figures that can be used to show local merchants the fallacy of expecting trade from highway traffic. It has been found that such traffic passing through small town main streets does not constitute potential business but, on the contrary, interferes with local traffic, which provides local business.

Under the heading "Highway Parasites," L. I. Hewes, deputy chief engineer, U. S. Bureau of Public Roads, San Francisco, classed roadside signs, infrequently used railroad track crossings, the increasing number of large buses and trucks and small town traffic requirements. Principally he was concerned with the removal of signs for reasons of appearance and safety. Anything tending to distract the driver's attention adds an element of risk to modern highway traffic. The efforts of several states in sign removal campaigns were commended. Safety in highway construction is now appreciated, as is evidenced by such features as wider shoulders, flatter crowns, easier curves and better surfacing. Safety of operation is next, and sign removal is important. The factor of appearance adds considerable weight to such a program, for beautification of highways has come to have a definite place in highway thinking.

Description of city planning problems in Tacoma by C. E. Putnam, city engineer, disclosed that the natural boundaries and topographical features of the city had resulted in some rather successful, although unprogrammed, city development features. The splendid park systems and the streets are due, in large measure, to these natural influences. Several attempts to follow plans set forth by hired experts failed because of local interference. At present the city has a local planning commission consisting of the mayor, the city attorney, the city engineer and seven appointive members. Future efforts of this body will begin with a definite campaign of public education in city planning needs.

City Paving Trends During Past Decade

The expansion of city street paving, which characterized the ten years ended Dec. 31, 1929, reached its climax in 1927, with decreases reported for 1928 and 1929, according to a survey of 201 representative cities made by A. H. Redfield of the United States Bureau of Mines, Department of Commerce. The upward trend, followed by a decline, was general in cities of all sizes included in this study but was most pronounced in cities of 40,000 to 100,000 inhabitants and in the Northeastern, Southeastern and Southwestern states. In the North-Central states the trend was downward from 1925 to 1929; in the Pacific and Rocky Mountain states it was generally upward.

Over the United States as a whole bituminous types of paving continued to lead, furnishing two-thirds of the total street pavement laid in the 201 cities from 1925 to 1929. The actual yardage of bituminous pavement laid in these cities, however, was 3.8 per cent less in 1929 than in 1925, and the ratio of bituminous pavement to the total pavement dropped from 70.4 per cent in 1925 to 62.1 per cent in 1928, rising to 65.1 per cent in 1929. The area paved with portland cement concrete amounted to one-fourth of the total pavement laid in these cities from 1925 to 1929, but the yardage of portland cement pavement increased by half during the period, and its share in the total pavement grew from 19.3 per cent in 1925 to 30 per cent in 1928, declining to 28.5 per cent in 1929. Brick, block and stone pavements, which constituted the remaining one-twelfth of the total pavement laid in the 201 cities, decreased one-third in yardage and declined in relative importance from 10.3 per cent in 1925 to 6.6 per cent in 1929.

Local preferences, based on such various factors as availability and cost of the different paving materials, cost of initial laying, local traffic conditions or even custom and tradition, largely govern the choice of the type of street pavement. Of all bituminous pavements laid from 1925 to 1929, inclusive, in the 201 cities comprised in this survey 70 per cent was laid east of the Mississippi River; 62 per cent of the national total was in cities lying north of the Potomac and Ohio rivers and east of the Mississippi River and Lake Michigan. On the other hand, 61 per cent of the portland-cement concrete pavement laid was put down west of the Mississippi River and Lake Michigan. Nearly 90 per cent of all brick, block and stone street pavements comprised in the survey was put down east of the Mississippi River and Lake Michigan.

ENGINEERING LITERATURE

A Monthly Review of Books and a Listing of New Publications

German Summary of City Refuse Disposal

REVIEWED BY SAMUEL A. GREELEY

Pearse, Greeley & Hansen, Hydraulic and Sanitary Engineers, Chicago

DIE FESTEN STADTISCHEN ABFALLSTOFFE: Ihre Beseitigung und Industrielle Verwertung.—Von Dr.-Ing. Camillo Popp. Munich and Berlin: R. Oldenbourg. Cloth; 6x9 in.; pp. 137; halftones and line drawings. 7.6 marks.

WITHIN the short space of 140 pages Dr. Popp gives a technical outline of the house refuse-disposal problem, covering more especially engineering (and to some extent hygienic) aspects, rather than administrative and operating problems. Of its 140 pages, the first three are a historical introduction, the next ten cover the quantity and character of refuse, five relate to collection, and the remaining 122 pages comprise brief descriptions of disposal methods with comments. The book will be of interest to American engineers desiring a well-arranged brief statement of European methods of refuse disposal, with a bibliography, some diagrams and illustrations and short references to methods in use.

The treatment is general rather than detailed, and summaries are stated without extensive supporting data. Thus the author gives the following typical unit quantities for house and domestic refuse:

Country	Quantity in Pounds Per Capita Per Day	Country	Quantity in Pounds Per Capita Per Day
Germany	0.88-1.10	England	1.10-1.76
France	1.32-1.54	United States	1.20-1.50

European house refuse is stated to have a weight of 930 lb. per cubic yard.

The methods of disposal described include dumping at sea and on land, "agricultural" use (twelve pages), sorting (with a condemnation of hand sorting), reduction, gasification (one page) and incineration. Incinerators are classed as those with hand-fired mutual assistance cells, single grates (shaft type) and mechanically operated furnaces. A minimum desirable temperature of 1,292 to 1,652 deg. F. is indicated; and a steam production of 0.7 lb. per pound of refuse (from and at 212 deg. F.) for refuse with a calorific value in excess of 3,968 B.t.u. Rates of burning of from 226 to 530 lb. per square foot of grate per hour are noted. The author appears to consider predrying of the refuse and preheating of the draft as desirable. There are more than twenty figures illustrating furnaces and grates.

The book indicates clearly the difference between American and European refuse and to some extent the effect of this difference on practice.

Of Broad Appeal

BIOLOGY IN HUMAN AFFAIRS—Edited by Edward M. East, Ph.D., Professor of Genetics, Harvard University, with contributions by Hugh S. Cumming, M.D. Surgeon-General U. S. Public Health Service, Morris Fishbein, M.D., Editor, *Journal* American Medical Association, and others. New York: Whittlesey House, McGraw-Hill Book Co. Cloth; 6x9 in.; pp. 399. $3.50.

SUCH a survey of one great branch of science as is offered by "Biology in Human Affairs" should have a broad appeal to members of all professional classes. The first two chapters, on biology and human problems, by the editor, and the prospects of the social sciences, treat the main subject broadly. Then come three chapters on various phases of psychology—its renaissance, its educational aspects and, of special appeal to many readers of this journal, psychology in industry. The chapter on heredity gives due weight also to the effect of environment on the individual. Everyone should be interested in the "Frontiers of Medicine," by the editor of the *Journal* of the American Medical Association. The chief and assistant chief officers of the federal health service are optimistic as regards the outlook of public health work. Physiology, zoology and diet in relation to nutrition are full of human interest. The chapter on efforts to increase the food resources is interesting and stimulating, but is more like a popular magazine article than the others. Its description of how animals, grains and fruits have been increased in quantity and quality through research, exploration and adaptation to different conditions is interesting and stimulating. Books on scientific subjects are not often of as broad appeal, so thoroughly up to date and so well written as this one.

Costs on Mechanized Building Construction

THE BUILDING ESTIMATOR'S REFERENCE BOOK: For All Classes of Buildings. By Frank R. Walker, Affil.Am.Soc.C.E., author of Practical Accounting and Cost Keeping for Contractors. Chicago: Frank R. Walker Co., 536 Lake Shore Drive. Flexible; 5x7 in.; pp. 1497; line cuts and halftones. $10 including the Vest Pocket Estimator of 220 pp.; illustrated.

BUILDING construction methods have followed the trend of mechanization in general construction during the past few years. Recognizing this trend, the author of the "Standard Building Estimator's Reference Book" has presented the seventh edition of his work entirely revised and rewritten. Every detail of building construction from the wrecking of existing buildings on the site to the painting of the trim of the new structure is given detailed consideration. Estimated costs are given in man-hours per unit of construction, appropriately leaving the supplying of wage rates to the estimator for individual cases. Accompanying the 1,500-page main volume is a compact vest pocket estimator, a handy quick-reference book of 220 small pages.

Status of Air Transport

AIR TRANSPORT OPERATION—By Wesley L. Smith. New York and London: McGraw-Hill Book Co. Cloth; 6x9 in., pp. 316. Many illustrations and tables. $4.

DEVELOPMENTS in air transportation have continued unabated. In spite of the headaches that the present depression gave many of the operators, they have been willing to go forward with their plans, and as a result have made some remarkable strides in improving safety and regularity of air transport schedules. This book is planned to give a detailed picture of present conditions and to point out some probable lines of future development. It meets both of these objectives admirably. Wesley Smith, the author, flew the mail himself in the early days of government operation and now occupies a responsible position with National Air Transport.

He is thus fitted by training and present interests to evaluate progress and prophesy trends. The reader will find in the book a fund of information. The problem of airway lighting is made understandable, and the needs are stated. Weather, the worst hazard, is discussed in terms of weather service reports, blind-flying instruments and radio developments. Airports and airplanes are analyzed from the transport point of view. As this is the viewpoint that the civil engineer in the airport field must assume in the future, the book is for him quite as much as for the air transport operator.

New Problems and Old Principles

ONWARD INDUSTRY: The Principles of Organization and Their Significance to Modern Industry—By James D. Mooney and Alan C. Reilley. New York and London: Harper & Brothers. Cloth; 6x9 in.; pp. 564. $6.

PROBLEMS of organization have required solution since the prehistoric day when one of our earliest ancestors first found a task beyond his strength and called upon a fellow for assistance. It is a far cry from this momentary partnership to the complex industrial corporations of today, yet the essential objectives of organization remain the same: the effective assembly of individual efforts for the attainment of a common purpose. Believing that efficient forms of organization can be evolved only from experience, and recognizing that industry lacks the necessary long-range historical background, the authors of this volume have gone back to other and older forms of association in an attempt to segregate definite principles of organization and to apply them to modern conditions.

The results of this historical research form an unusual and highly interesting book. At first thought it may seem far-fetched to attempt to draw a parallel between the government of Russia, the army of imperial Rome or the Catholic Church and, for example, an organization like the General Motors Corp.; yet each of these faces, or did face, the problem of controlling and effectively utilizing a far-flung organization formed for a specific purpose. Furthermore close examination discloses that every successful organization, regardless of its purpose, naturally tends to follow a definite pattern which, although subject to variations in detail, corresponds in principle with other entirely dissimilar groups. The pattern may expand or contract in accordance with the size and complexity of the organization to which it is applied, but its elements are, and must be, ever present or disintegration inevitably follows. History confirms the truth of this statement, whether the objective to be attained be political, military, religious or merely the earning of a profit through service.

After having demonstrated this truth with convincing logic supported by a mass of historical data, the authors turn their attention to the field of industry, tracing the growth of mass production, pointing out the problems it presents and applying the lessons of the past to their solution. Throughout the discussions the larger viewpoint is maintained; mass production is regarded as a means rather than as an end in itself. Industrialism is a tool now serving as an aid in raising the world's standard of living—a sharp-edged tool, difficult to control and subject to misapplication, but very effective and filled with vast potentialities. Its proper and effective utilization, involving efficient production and distribution and the building up of a market sufficient to maintain production, is the task of industrial management.

"Onward Industry" is unique in conception and comprehensive in viewpoint, is of absorbing interest to those who are not afraid to think with, rather than to follow after, an author. Its one drawback, which is perhaps unavoidable, is that the first few chapters dealing in general terms with the characteristics and forms of organization call for very close and intensive reading, tending to discourage the ordinary reader. Once this barrier has been passed, however, the smooth, logical style sustains interest to the end.

Sewage Disposal Principles and Practices

PURIFICATION AND DISPOSAL OF SEWAGE—By C. J. Nurse, Late Engineer, K.A.R., Zomba, Nyasaland, Central Africa. [Lockwood's Manuals.] London: Crosby, Lockwood & Son. Cloth; 5x8 in.; pp. 122; line cuts. 4s.

THOSE who wish a brief, simple and clear exposition of the principles and practice of sewage disposal will find them in Mr. Nurse's little book. An hour is enough for a fairly careful reading of the book and will be time well spent even by those who have specialized in sewage treatment. Those who have given little attention to the subject can well devote some time to the book. The reader should remember that the book is written from the British viewpoint, but this applies less to the discussion of principles than to their application.

The opening chapters deal with the history of sewage treatment, scientifically considered, the nature of sewage and the principles underlying its treatment. A general idea of the various processes and their relation to each other having been given, each of the principal methods of treatment is taken up: dilution, hand treatment, both intermittent filtration and broad irrigation, clarification or sedimentation, oxidation (contact, and more particularly percolating filters), sludge treatment and disposal, and the activated-sludge process. The last chapter deals with standards and analysis of effluents, and is more distinctively British than the rest of the book. The few but sufficient illustrations are well chosen.

The brevity of the book will partly excuse its failure to give credit to the pioneer work in sewage treatment done by Americans, particularly at the Lawrence Experiment Station of the Massachusetts state board of health. Most of these omissions relate to the establishment of fundamental principles and suggestions and detract little from the value of an excellent book. Particularly commendable is the sane consideration given to disposal by dilution, supplemented by the treatment demanded by local conditions.

New Textbook on Mechanics

ENGINEERING MECHANICS—By Frank L. Brown, B.S., Professor of Applied Mechanics, University of Kansas. New York: John Wiley & Sons, Inc. London: Chapman & Hall, Ltd. Cloth; 6x9 in.; pp. 477; many illustrations. $4.

TEXTBOOKS on engineering mechanics are difficult to review because there is no common measure by which their contents and arrangements may be evaluated. Each book is an expression of the author's teaching habits. Usually it is based upon notes and problems he has used with success in his classroom and perhaps originated because of dissatisfaction with existing textbooks. Prof. Brown's book follows such a pattern and is based on many years of teaching experience. Like all books on mechanics, it is planned for the college student. However, the illustrative problems and the groups of problems to be solved that occur every four or five pages are of an intensely practical nature and should make the

book useful to graduate engineers and others who want to review principles in terms of actual enginering problems. Part I is devoted to statics, taking up force systems, center of gravity determination and friction, together with chapters on plane trusses and suspended cables. Part II treats kinematics and kinetics and in one respect departs from some other textbooks on mechanics —namely, in ignoring the term mass in developing the formulas, utilizing in its stead the factor W/g. This is done to forestall any difficulty the student may have in differentiating between mass as in engineering terminology and as used by physicists.

For Bridge Specialists Only

SIMPLIFIED CALCULATION OF STATICALLY INDETERMINATE BRIDGES: With appendix, Exact Theory of Three-Span Suspension Bridges—By G. G. Krivoshein, Mil.Eng., Civ.Eng.; Formerly Major General, Corps of Engineers of the Russian Empire, etc.; now Professor of the Technical Institute, Prague. Published in English by the Author, Bubenec, Buckova 27, Prague, Czechoslovakia. Also may be had in Czecho from Ceska matice technicka v Praze (Technical Publishing Society in Prague). Cloth; 7x10 in.; pp. 291; line cuts, pen-and-ink sketches and halftones. $5 postpaid for the edition in English.

AMONG the avowed purposes for which Prof. G. G. Krivoshein wrote this book was that of presenting a method of designing statically indeterminate bridges that requires only one set of calculations and which he claims gives exact results. Basically, his method departs from the assumption of a constant ratio between the areas of the chords of the trusses at any cross-section and assumes that these areas are proportional to the depths of the trusses. His working equations utilize the moments of inertia instead of the areas and present the assumption that the moments of inertia are proportional to the cube (the $2\frac{1}{2}$ power in some cases) of the depth of the truss. A second characteristic of his method is the use of independent equations—that is, each equation containing only one unknown, accomplished by suitable choice of axes of coordinates and transfer of the origin if necessary. After the establishment of this method in his introduction, the author devotes the remainder of the book to its application to many well-known bridges in this country as well as in Europe. He also utilizes as examples many multiple statically indeterminate bridge designs that have been proposed but never built. There are chapters on self-anchored suspension bridges and combined suspension and arch bridges. The last chapter is devoted to methods of preliminary determination of weight and cost for long-span suspension bridges. Bridge designers will find the book interesting, perhaps stimulating and useful.

An Ambitious Undertaking

WATER TRANSPORTATION: A Bibliography, Guide and Union Catalog—By M. E. Pellett, Special Assistant (Executive Offices) —Port of New York Authority. With the Cooperation of 34 North American Libraries. Vol. 1. Harbors, Ports, and Terminals. New York: The H. W. Wilson Co. Cloth; 6x9 in.; pp. 685. $10.

WHAT seems to be the most ambitious attempt in the field of engineering and allied cataloguing, bibliography and indexing is five large volumes on, "Water Transportation," edited by M. E. Pellett, with the cooperation of 34 libraries, various associations and many individuals. Considering the magnitude of the task, it is not surprising that the references are limited to the present century and for the most part to American sources. The first volume, "Harbors, Ports and Terminals," is just out. It is in three parts: classified bibliography, an index, and a directory of publishers. The bibliography is also in three parts: (1) general works, including engineering, equipment and administration; (2) ports of the world and geographic divisions, subdivisions; (3) periodicals, proceedings and transactions, with particular reference to their indexes.

Underground Electric Systems

UNDERGROUND SYSTEMS REFERENCE BOOK: Prepared by an Editorial Staff of the Underground Systems Committee, Engineering National Section, National Electric Light Association. New York: National Electric Light Association, 420 Lexington Ave. Cloth; 9x12 in.; pp. 377; many illustrations. $4 to members, $6 to others.

FOLLOWING a historical review of the development of underground systems and a general survey of modern underground cable practice, detail chapters cover cable and cable insulation, conduit and manholes, cable installation, splices and terminals, equipment and safety practice. The appendix contains general information and a complete bibliography. The book is an authoritative compilation of material on planning, constructing and operating underground systems, of interest to public utility engineers, construction men and operators.

Revision of a Pioneer Book in Its Field

REINFORCED-CONCRETE BRIDGES: The Practical Design of Modern Reinforced-Concrete Bridges, Including Notes on Temperature and Shrinkage Effects—By W. L. Scott, M.Inst.C.E., Chief Engineer, Considère Constructions, Assisted by C. W. J. Spicer. Third Edition, Revised and Enlarged. London: Crosby Lockwood & Son. Cloth; 6x9 in.; pp. 268; 181 line cuts and 33 halftone plates. 28s.

THE first edition of this book was reviewed at some length of these columns Sept. 17, 1925, p. 479, by A. Burton Cohen, consulting engineer, New York City. The reviewer said that the book was the first one on the design of reinforced-concrete bridges and, as such, commended it but made some minor criticisms. In conclusion, the reviewer said that "if more of the author's experience in construction problems affecting design had been given the work would be of far greater value."

The present edition has been enlarged by a fourth. The chapter on loading has been revised and enlarged. A chapter on the design of long-span bridges has been added. The "recent innovation involving the use of hydraulic jacks to eliminate secondary stresses is fully explained, with photographic illustrations." (This "innovation"—Freyssinet method—is now being used by the Oregon highway department on the Rogue River bridge.) Pigeaud's method of deck slab design, "now becoming general," is more fully treated than in the first edition. The standard specification for reinforced-concrete bridges (whose not stated) has been revised. A description of the Plougastel bridge, over the Elorn River, in France, with halftone illustrations, has been added.

Publications Received

THE CORRECT PRICE of Shelton's "Architectural Shades and Shadows," reviewed on p. 1022 of our issue of June 18, is $3.50 instead of $3.75. (D. Van Nostrand Co., New York City.)

STANDARDIZATION of Weighing Devices for Concrete Aggregate and of Steel Forms for Concrete Pavements are treated briefly in Bull. 13, American Road Builders' Association, National Press Building, Washington, D. C.

REVISED EDITIONS have been issued of two of "Port Series" prepared by the Corps of Engineers, U.S.A., in cooperation with

the bureau of operations, U. S. Shipping Board: One covers Los Angeles and Long Beach and the other San Diego and San Luis Obispo, all in California. (60c. and 45c. from Superintendent of Documents, Washington, D. C.)

"PUBLIEKE WERKEN" is the name of monthly journal which made its initial bow in June of this year. It is the official organ of Van de Vereeniging van Directeuren van Gemeentewerken. It is edited by a committee headed by Ir. F. Joh. Blom, e.i., Adjunct-Director of Public Works, Rotterdam, and the main editorial office is Joh. Verhulstraat. 164 hs, Amsterdam Z, Holland.

PIER AND WHARF CONSTRUCTION is the subject of revised regulations adopted in May by the National Fire Protection Association, 60 Batterymarch St., Boston, Mass., superseding those of 1924. The major change is the inclusion of unprotected steel construction as an approved method when the pier is fully covered by automatic sprinklers as outlined in the new regulation. For copies address the association.

New Books and Revised Editions

[*Those desiring copies of the books listed below or mentioned elsewhere in this section should order them from the publishers or from their local booksellers.*]

CALCUL DES POUTRES: Supportant des Planchers et Certaines Charges Particulières—By Paul Roger, Ingénieur Civil, Licencié ès sciences. Paris: Donod, 92 Rue Bonaparte. Paper; 7x10 in.; pp. 178; many illustrations. 51 francs in Paris.

Intended as a guide for the design of floorbeams under various types of load distribution, among which are (1) triangular and trapezoidal distribution covering the full length of the beam; (2) triangular or trapezoidal loading not corresponding to the span of the beam and placed in any manner whatever on it; (3) uniform load occupying all or a part of the beam. In addition, a certain number of special cases of load distribution are examined, chiefly bearing on lintel design.

CEMENT CHEMISTRY IN THEORY AND PRACTICE—By Prof. Dr. Hans Kühl, Director of the Institute for Cement Research, Berlin. Translated by J. W. Christelow, B.Sc. London: Concrete Publications, Ltd. Cloth; 6x9 in.; pp. 64; illustrations. 7/6 net.

A discussion by the director of the Institute for Cement Research in Berlin largely concerned with cement manufacture but including an analysis of high-strength alumina cements that should also interest the user. An electric furnace that can burn from 50 to 100 grams of cement to exact specifications and a series of tests for such small quantities is described. The theory of cement burning, the constitution of portland cement clinker and the problem of hardening as it bears on cement research are considered.

COMPRESSIVE STRENGTH OF CONCRETE IN FLEXURE AS DETERMINED FROM TESTS OF REINFORCED BEAMS—By Willis A. Slater, C.E., Research Professor of Engineering Materials, and Inge Lyse, B.S. in C.E., Assistant Engineer, Portland Cement Association, Chicago, Ill. Bethlehem, Pa.: Lehigh University. Paper; 6x9 in.; pp. 44; illustrations. 20c.

CORROSION OF POWER PLANT EQUIPMENT BY FLUE GASES—By Henry F. Johnstone, Special Research Associate in Chemical Engineering, Engineering Experiment Station, Urbana, Ill. Paper; 6x9 in.; pp. 122; illustrated. 65c.

EXEMPLES PRATIQUES de DISPOSITIONS D'ARMATURES DANS LES OUVRAGES EN BÉTON ARMÉ—Par V. L. Kouznetzoff, Conducteur des Travaux Publics, Assistant Constructeur de la Maison Dr. Ing. Skorkovsky a Prague. Paris: Donod, 92 Rue Bonaparte. Paper; 10x12 in.; pp. 45; many illustrations. 36 fr. in Paris.

Presents a collection of drawings showing recommended arrangements for the reinforcing steel in various types of reinforced-concrete members. It is the author's belief that most of the failures of reinforced-concrete structures can be charged to improper reinforcing systems, and the drawings presented by him are believed to represent safe and efficient practice.

GRADING METHODS AND GRADING EQUIPMENT: Construction and Completion of Embankments—First presented as a committee report in November, 1930, and later, after revision, approved in 1931 by American Road Builders' Association, National Press Building, Washington, D. C. Paper; 6x9 in.; pp. 40; illustrated. Free on application.

GRUNDWASSER—ABDICHTUNG: Darstellung aus der Praxis—Von Dr.-Ing. Joachim Schultze. Dritte Auflage, neubearbeitet von Dr.-Ing. Willy Sichardt. Paper; 6x9 in.; pp. 69; line cuts and halftones. 5 marks.

INVESTIGATION OF PRESSURES AND VACUA PRODUCED ON [AIRSHIP] STRUCTURES BY WIND—By Harold Mactavish Sylvester, Lieut. (J.G.) (C.E.C.) U.S.A. Thesis for M.C.E., June, 1929. Troy, N. Y.: Rensselaer Polytechnic Institute. Paper; 6x9 in.; pp. 53; illustrations.

MUNICIPAL AUDITORIUMS—By Edna Trull. New York: Municipal Administration Service, 261 Broadway. Paper; 7x10 in.; pp. 34. 35c.

Outlines history, gives physical data, recounts litigation and legislation; then takes up financing, utilization, relation to city plan. Tabulated data include list of cities owning auditoriums, statistics for 119 cities by population groups, fees charged when rented and other subjects.

PORT AND TERMINAL CHARGES AT UNITED STATES PORTS—By Board of Engineers for Rivers and Harbors, War Department, and Bureau of Operations, U. S. Shipping Board. Paper; 6x9 in.; pp. 635. ($1.25 from Superintendent of Documents, Washington, D. C.)

Besides much information on charges, describes briefly each port, its general facilities, nature of commerce and related matters.

REINFORCED-CONCRETE MULTIPLE ARCH BRIDGE ON ELASTIC PIERS—By H. Yu, B.Sc. (Glasgow), lately Assistant Engineer, Peiping Liauning Railway, China. Paper; 6x9 in.; pp. 39; line cuts. For copies address the author, 5a Si-Siao-Shaun-a-Chuang, North end of Pei—Hsin-Hwa-Chieh, China.

A "mathematical exercise" in the design of a double-track railway bridge over the Lan River. The author states that his reason for writing the article was "the scarcity of engineering literature" on the subject "and the incorrectness of formulas given by two well-known American authors (Hool and Kinne: Reinforced Concrete and Masonry Structures, 1924)."

RELATIVITY: An Interpretation of Einstein's Theory—By Mario Palmieri, B.Sc., M.E., Los Angeles: Forbush Publishing Co., 417 East Pico St. Cloth; 8x11 in.; pp. 87. $2.

WIND PRESSURE ON A MODEL OF A MILL BUILDING—By Hugh L. Dryden and George C. Hill. Reprint from Bureau of Standards *Journal of Research*, April, 1931. Paper; 6x9 in.; pp. 21; illustrated. (10c. from Superintendent of Documents, Washington, D. C.)

LETTERS TO THE EDITOR

Experimental Filter Tubes

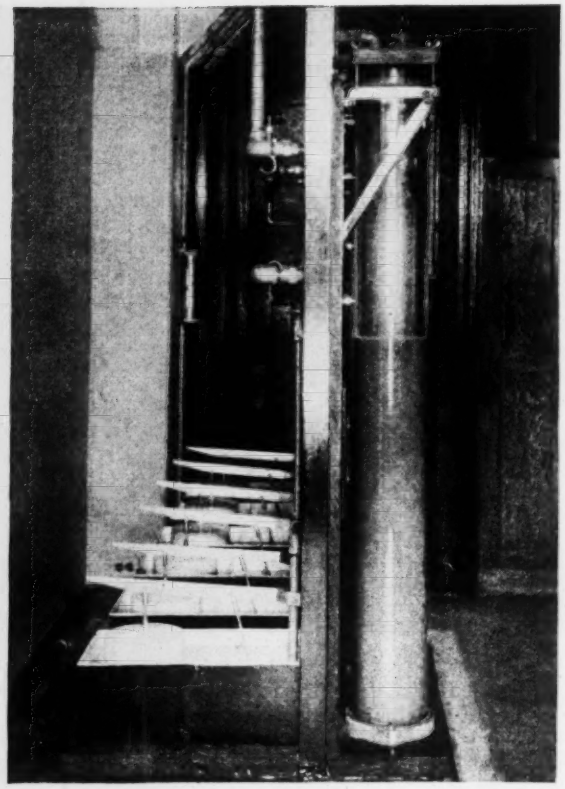
Sir—The recent editorial and symposium on the size and grading of filter sand (*ENR*, Dec. 4, 1930, p. 873, and May 7, 1931, p. 770) are very timely and serve to call attention to the present unsatisfactory status of filter-sand specifications. Although a great deal of past study and research has been devoted to an attempt to discover an exact basis for a rational choice of sand size, grading, grain shape and depth of bed, there still exists a disheartening lack of data of a sufficiently fundamental nature to serve as a positive guide in design.

The importance of being able to predict accurately for a given sand what the loss of head will be for a known depth and rate of flow is quite apparent, yet no such prediction is possible at present, except by actual trial. After considerable preliminary experimentation relative to the design of apparatus to carry on a study of the filtering characteristics of sand, the writers have recently built a battery of six experimental glass filter units for this purpose.

The size of the filters has been made such that no great rise of temperature will take place in the water during its passage through the tubes, as this would release dissolved gases within the sand, creating a greater loss of head than would otherwise be obtained. Glass tubes 6 in. in diameter and 50 in. long were selected. A 30-in. depth of sand in these filters has a volume less than ½ cu.ft.—a quantity easy to handle. The tubes are mounted between two brass castings and sealed with rubber gaskets and cement. The lower casting is funnel shaped and filled with graded gravel to give good distribution. The sand is entirely separated from the gravel by a perforated brass disk covered with a 100-mesh screen secured to the top of the lower casting. The upper casting is slightly conical to prevent air trapping and is supplied with a plug to allow the introduction and removal of sand without dismantling the tube.

A modified Weston rate controller has been adapted for this apparatus. It consists of a float-controlled valve operating in a constant-head box. The vertical discharge pipe from the bottom of the box is throttled by a circular disk slightly smaller than the pipe, secured to the float riding above it. The disk, attached to the float, creates an annular orifice discharging under a constant head. The disk is secured to the float by a ¼-in. brass pipe passing through the center of the float and held at the top by a threaded brass collar. The disk is perforated, with the holes capable of being entirely closed off by a smaller disk beneath it. The smaller disk is secured to a brass rod passing through the pipe and threaded into the brass collar at the upper end. To change the rate of flow, the float is rotated until the desired rate is obtained, rotation causing a variation in the distance between the two disks. The controller is easy to adjust and will maintain a constant rate within 3 per cent.

The whole apparatus consists of six filter units. If desired it can be divided into three sections of two filters each, with a differently prepared water applied to each section. At present the applied water comes from a



Six-inch glass tubes used at Detroit

constant-head box supplied with either coagulated water from the filter plant or with unchlorinated filtered water. The change from one to the other can be made without interrupting the filter service.

ROBERTS HULBERT AND DOUGLAS FEBEN,
Senior Chemist and Junior Chemist,
Department of Water Supply.

Detroit, Mich.,
May 28, 1931.

A Proper Balance for Waterworks Papers

Sir—In your issue of June 18 the editorial entitled "Water Purification' Ascendant" deserves critical comment. Its tone is such as to suggest that your headline writer did not quite catch the feeling of the editorial writer, who seems to be thinking in the term "blatant" or "irritant" rather than "ascendant." You say, for example:

> Is the waterworks profession in danger of losing perspective as to the relative importance of purification in water-supply engineering? . . . At the Pittsburgh convention the meetings of the purification division usually had a capacity attendance . . . The explanation may be that purification methods are developing more rapidly than the practice of water supply, or it may be found in the fact that purification men are more articulate than their colleagues of the supply and distribution service.

There are some simple facts back of the situation. One is that the program committee has much material offered to it in the purification field and is frequently put to the necessity of developing papers of the general nature so evidently desired by you.

The purification man by virtue of his training and the necessities of the situation tends to reduce his results to writing and to compare them with fellow workers. Too frequently the men in other phases of water supply think of their work as a case in itself, not needing recording, and it is compared with other experiences only in conversation.

This is regrettable. From the standpoint of program building, if not the general good of the field, it would be desirable to encourage any tendencies to present intelligently new and worth-while facts in general water-supply practice. One doubts whether deprecation of the willingness to talk on the part of the purification man is quite the way to encourage the now too-silent group.

Members of the A.W.W.A. could study with profit the publications of the National Electric Light Association, where one quickly learns that not all construction and distribution men are silent. The secret of the N.E.L.A. situation seems to be the widespread participation of members in carefully planned and well-coordinated research in many phases of the electric field.

There is no magic formula for getting men to attend technical sessions. Out of a total registration approaching 1,100, less than 500 are accounted for in sessions at any one time during the A.W.W.A. convention.

The crowded condition of the purification division sessions is due, among other things, to the willingness of these members to listen to what is being said by someone else. Now willingness to listen cannot be commandeered, but it is essential to the success of any technical organization.

Your editorial closes with this sentence: "But purification is secondary after all; white-coated filter attendants or laboratory technicians can never compensate for inadequate distribution systems or excessive pumping costs." This is true to a certain degree, but the sentence can well be reversed in the suggestion that low pumping costs for an adequate supply at good pressure cannot also compensate for lack of safety in or unpleasant taste of the water distributed. There is a rational balance that goes to make up good service.

A well-considered evaluation of the broad-visioned relative weights of various factors in public water supply was presented at one session of the convention, and almost 50 of the 1,100 registrants were interested enough to attend. A careful effort was made in this paper to show the many factors that go to make up a well-managed water-supply business. Purification factors were given their proper weight—probably lower than many purification men would think they deserved. But few members listened to the presentation.

That is regrettable and one may concisely say that the remedy for it and the general building up of the A.W.W.A. consists in the membership at large becoming more willing to present and listen to results of research than they are at the present time.

H. E. JORDAN,
Secretary, Water-Purification Division,
American Water Works Association.

Indianapolis, Ind.,
June 27, 1931.

Wind Design for Tall Buildings

Sir—In the third article of your present series of articles on "Wind Design for Tall Buildings" H. V. Spurr is specially to be commended for his insistence on the importance of elastic deflections and the role of heavy columns in the design. In spite of secondary stress analysis, indeterminate structure analysis by least work methods, vibration studies in machine structures and the like, altogether too few of our engineers really have any understanding or appreciation of the important role stiffness, as distinguished from strength, plays in a structure.

Mr. Spurr suggests that much information on air currents is necessary. It occurs to me that there is much information of a semi-theoretical nature available which, worked up into an article by properly qualified men, might shed much light on gusts and wind velocities. Vortices in perfect fluids are subject to calculation. They always occur when a layer of fluid at high velocity passes a surface or layer of air at low velocity. Prandtl has made studies of the so-called boundary layer in an attempt to determine where vortex motion may be set up. Vortices have calculable velocities, frequencies of occurrence and the like. A preliminary theoretical study of this sort by a man acquainted both with meteorology and fluid dynamics as it has developed in the aeronautical laboratory in the last few years should be a most important guide to the engineer and is essential to an intelligent attempt at the study of winds, gusts, etc., through experimental investigation. It is wrong for the engineer to assume that nothing of value to him has been done along these lines. As a matter of fact an enormous amount of material awaits an interpreter to make it available to the engineer.

Bethlehem, Pa.,
June 23, 1931.

EDWARD ADAMS RICHARDSON.

NEWS OF THE WEEK

Lone Bid for Golden Gate Bridge Bonds Rejected

Only one bid was received on the first block of Golden Gate Bridge bonds totaling $6,000,000, offered for sale in San Francisco July 8. The bid, which came from Dean, Witter & Co., San Francisco, was rejected, because of its conditional character, by the directors of the Golden Gate Bridge and Highway District upon the recommendation of the bond committee. The bid contained an offer to pay a premium of $1 and accrued interest on the initial $6,000,000 issue with these provisions: (1) that a state supreme court decision be obtained as to the right of the bridge district to levy taxes and to establish the bridge bonds as a lien upon all the property of the district; (2) that Dean, Witter & Co. be allowed to employ independent engineers to prove the stability of the foundation.

Other bond houses have announced that they would not bid on the bonds until the legal and engineering features are cleared up. Final decision on the foundation is awaiting action of the board of directors of the bridge district.

The bond committee will make further recommendations as to the sale of the bonds to the entire board of directors of the district at a meeting to be held on July 15.

The board of directors withheld the awarding of contracts for the construction of the bridge, the bids having been received June 17 (*ENR*, June 25, p. 1065), until the bond sale question has been settled. The district is holding $9,000,000 in certified checks deposited by bidders on various units of the bridge and the checks must be returned by July 17.

O. E. Carr Made First City Manager of Oakland, Calif.

Ossian E. Carr, who had been city manager for Fort Worth, Tex., since 1925, became the first city manager of Oakland, Calif., on July 1, at a salary of $20,000. Mr. Carr has a record of seventeen years of continuous service as city manager in six different cities. He was born in Pennsylvania in 1876 and was graduated in civil engineering from Allegheny College in 1900. After experience in municipal engineering work in Pittsburgh, Seattle, Portland, Ore., and Cincinnati, he was appointed first city manager of Cadillac, Mich., in 1914. He was then successively city manager of Niagara Falls, N. Y.; Springfield, Ohio; Dubuque, Iowa, and Fort Worth. Mr. Carr has served as secretary and as president of the City Managers' Association.

Gross Negligence in Erroneous Survey of San Gabriel Dam Site

California board finds insufficient ground for revocation of license but censures engineer

AFTER exhaustive hearings on a complaint of incompetence against J. H. Payne, of Los Angeles, whose survey of the abandoned San Gabriel dam site was the basis of serious charges against E. C. Eaton, engineer of the Los Angeles County Flood Control District, subsequently disproved by a grand jury investigation, the state board of registration has severely rebuked Payne for "gross and inexcusable negligence and an utter disregard for the reputation and professional integrity of a brother engineer." It found the faulty survey to be the result of negligence and mistakes rather than incompetence, and therefore did not revoke Payne's license. The registration act prior to its recent amendment recognized only gross incompetency as cause for revocation of license.

Big Discrepancy in Figures

The case grew out of suspension of work in September, 1929, on the 500-ft. San Gabriel dam because of bad rock exposed in the abutment excavation (*ENR*, Sept. 26, 1929, p. 509) and subsequent settlement of the contractor's

(*Continued on page 112*)

Wage Law in Illinois Causes More Delay on Public Work

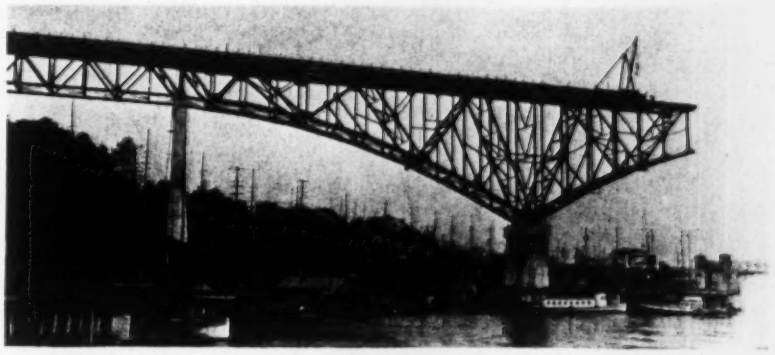
As stated in last week's issue, the passage of a prevailing wage law to apply to public-works contracts in Illinois has had the effect of deferring several large contracts. The Sanitary District of Chicago has postponed the date of receipt of bids on the Calumet extension works. The latest outcome of the application of the law is the recall of notices for bids for road and bridge construction by the state division of highways. A notice to contractors issued by the division reads as follows:

Under dates of June 24, 1931, and July 1, 1931, this department issued notices calling for bids for road and bridge construction to be received at 10 o'clock a.m. on July 15, 1931. Notice is hereby given that this letting will be cancelled.

Such action is necessary because of the passage of certain legislation by the 57th general assembly designated as House Bill No. 307 which relates to the length of working hours and wages to be paid on public-works contracts. This legislation materially affects the methods of advertising for bids and awarding of contracts, and consequently the work contemplated for the July letting must be readvertised in accordance with the provisions of this new law. This work will probably be advertised at a later date.

Tennessee Faces Halt of Highway Construction in September

Failure of the recently adjourned Tennessee legislature to provide funds for the continuance of the state highway construction program will result in the



LAKE UNION BRIDGE, SEATTLE, WASH.

The illustration above shows construction on the Lake Union bridge, over Lake Washington Canal at Aurora Ave., Seattle, Wash. The bridge is of cantilever-type construction, with 135 ft. vertical clearance of main span. Its total length is 3,000 ft. with an 800-ft. main span. Construction started Nov. 15, 1929, and is expected to be completed Sept. 1, 1931. The bridge is being built by the State of Washington under the direction of the state highway department. The United States Steel Products Co., Seattle, has the contract for the superstructure, the Pacific Bridge Co., Portland, Ore., is building the four main piers, and D. Nygren, Seattle, the approach. R. M. Murray is the resident engineer. Jacobs & Ober, Seattle, are consulting engineers on design.

complete stoppage of new work by the middle or latter part of September, unless emergency measures can be taken in the meantime. According to R. H. Baker, commissioner of highways and public works of that state, funds in hand will permit only the completion of existing contracts. Thereafter income from the gasoline tax and motor license fees will be sufficient only for debt service and maintenance during 1931, and accumulation of only a small surplus which may be devoted to construction in 1932.

Unless corrected, this development will throw from 4,000 to 5,000 men out of work in Tennessee this fall. It also will affect adversely a wide circle of producers of materials and equipment. At the same time rather complete disorganization of the state highway engineering staff and field forces will be inevitable.

Negligence in Survey of San Gabriel Dam Site

(*Continued from page 111*)

claims by payment for all excavation he had made, both within and without the pay lines laid down by Eaton. The amount of this excavation was found by Eaton's surveys to be 773,646 cu.yd. The county made full settlement for this amount on Jan. 30, 1930 (*ENR*, Feb. 6, 1930, p. 263). In July, according to the evidence brought out by the board, Payne was employed by the Los Angeles *Illustrated Daily News* through the intermediary of B. F. Jakobsen, a local engineer, to survey the excavation, which he did on July 4, 1930, reporting by affidavit that 500,000 cu.yd. had been excavated. This affidavit was published by the *Illustrated Daily News* to support charges of theft of public funds. Later a board of engineers employed by the county grand jury confirmed Eaton's figures and showed Payne's survey to be grossly wrong, after independent surveys (*ENR*, Nov. 20, 1930, p. 813).

Upon receiving a complaint relating to Payne's misleading figures, the board made a preliminary investigation and then held formal hearings. In the hearings the board found that the survey had been made in one day with a crew of five men; in addition, the defendant admitted of making a 60-ft. error in linear measurement.

The board found as a result of its hearings that a survey of this magnitude could not be made in one day and be within 10 per cent of being accurate (the degree of precision that Payne claimed); that the defendant should have exercised more care and insisted on more explicit instructions; that he should have checked both survey work and computation and, having found such a large discrepancy between his figures and the official ones, should have withheld any signed statement until the work was checked. As a result of these findings, the board considered Payne's actions to constitute gross and inexcusable negligence, but did not find that the case involved incompetency or lack of engineering knowledge and, therefore, did not feel warranted in revoking Payne's license.

Twelve States Now Have Laws Governing Wages Paid on Public Construction Work

A TELEGRAPHIC survey of the entire country reveals that twelve states now have laws requiring the payment of prevailing or minimum wages on public construction work. In two of these states, Ohio and California, the laws are not yet in operation, taking effect Aug. 1 and Aug. 14, respectively. Seven other states control wages by various regulations, without specific authorization by laws. The remaining 29 states report no regulation or wage laws prevailing, though in several cases wage bills were defeated in the last sessions of the legislatures. The survey was made through all the state highway departments.

Provisions and scope of the various laws in effect vary widely. Work is reported held up because of the laws in Illinois and California. Following are the states now having wage rate legislation:

California — The law goes into effect Aug. 14, and until then all lettings have been postponed. Wages to be paid will be stated in the call for bids. Municipal and county work come under the terms of the law.

Illinois—Law was effective July 1. It provides that no laborer or mechanic be permitted to work more than eight hours and that prevailing rates of wages must be specified in advertisement for bids in connection with all public-works contracts. Serious delay to proposed work by the Chicago Sanitary District because of the bill has been reported. The state highway department has cancelled calls for bids to have been opened July 15, with the announcement that the work will probably be advertised at some future date.

Kansas—Kansas has a law providing that current rates of wages must be paid on all public construction work and that eight hours constitutes a day's work.

Massachusetts—Prevailing rates of wages must be paid to teamsters and mechanics by contractors on all public work in Massachusetts. A bill to extend the terms of the law to include laborers was presented at the last legislature, but failed to pass.

Minnesota—A 45c. minimum wage rate is in effect on Minnesota state trunk highway work, which does not affect county or municipal work. The wage rate is specified in the proposals.

Nevada—The minimum wage for unskilled labor on state contracts in Nevada has been set by law as $4 per day. The rate is not specified in calls for bids, but contractors are warned before award of contract that they must comply with state labor laws.

Montana—Montana has a prevailing-rate-of-wages law applying to state, county, municipal and school construction. The law does not apply to federal-aid highway work. The rates paid must be same as those paid in county seat of county in which work is being performed.

New Jersey—New Jersey has an act of 1913 requiring payment of prevailing rates of wages on all state, county and munic-

FLEET OF 300 CARS READY FOR NEW YORK'S NEW SUBWAY SYSTEM

The above view shows a portion of the fleet of 300 new cars bought by the city of New York for operation in its new subway system. Part of the system is expected to be in operation late this year. The cars are different from any ever used before on New York subways, having no end vestibules and being equipped with four doors on each side. Pending controversy over the unification of New York's rapid transit system, it has not been determined whether the city or one of the present operating companies will operate the new subway line.

ipal work. The rates are not specified in calls for bids.

New York—The New York labor law provides that prevailing wages must be paid on all public construction, including state, county and municipal work. State highway work is specifically exempt from most of the provisions of the labor law. Rates are not specified in calls for bids, but specifications state that prevailing rates must be paid.

Ohio—An act effective Aug. 1 gives the highway director of Ohio power to set minimum rates to be paid on highway work. The rates will probably be specified in calls for bids. Several municipalities have passed ordinances affecting wages.

Pennsylvania—A Pennsylvania law provides that state officials must specify minimum wages to be paid mechanics and laborers in calls for bids. Municipal work is not affected.

Wisconsin—Effective July 7, a Wisconsin law provides that prevailing rates of wages must be paid to laborers on state highway work. Other classes of labor may be included under the law if the highway department so desires. Acting on the advice of the highway department as to the following year's program, the state industrial commission will annually determine the rates to be paid in the various counties in which the state contemplates highway construction.

The following states have special regulations, not a part of any law, affecting wages to be paid on public works:

Arizona—For the past few months the state has requested statement from contractors that they would pay standard scale on public works.

Colorado—The Colorado state highway department has an understanding with contractors before award of contract as to what minimum rates of pay will be. These rates are filed with the state industrial commission after approval by highway department.

Iowa—The Iowa state highway department passed a resolution last November fixing the minimum rate of pay on highway work at 40c. per hour. All contractors are requested to base their estimates on this minimum rate.

Michigan—The Michigan state highway department now has a number of contracts under way in which a minimum wage scale has been included.

New Hampshire—The governor and council of New Hampshire have ruled that 40c. per hour shall be the minimum rate on public-works construction, and that nine hours shall constitute a maximum day's work.

Oregon—The Oregon highway commission has requested contractors on its work to maintain living wage scales for laborers.

Wyoming—The Wyoming highway commission is requiring contractors to sign a stipulation to pay prevailing wages before award of contract. This plan has the approval of reputable contractors throughout the state.

Last year South Carolina adopted a minimum wage scale for highway work, but abandoned the plan in May of this year. Connecticut, Rhode Island and West Virginia report failure of wage laws to pass last legislature. Utah reports wage scale of past two years is being maintained. Washington allows United States citizens only to be employed on public works. Attempts have failed in Texas to force contractors to pay certain rates. Louisiana has a law providing that only voters be employed as skilled laborers on state work. The average common labor wage in Louisiana is given as 20c. per hour.

States reporting no wage laws or regulations are:

Alabama, Arkansas, Connecticut, Delaware, Florida, Georgia, Idaho, Indiana, Kentucky, Louisiana, Maine, Maryland, Mississippi, Missouri, Nebraska, New Mexico, North Carolina, North Dakota, Oklahoma, Rhode Island, South Carolina, South Dakota, Tennessee, Texas, Utah, Vermont, Virginia, Washington and West Virginia.

The Business Outlook

While few of the well-known indicators suggest reversal of the downward trend of the past few months, there is growing confidence that the near future will witness a strong revival of general activity. Steel ingot production has been affected by the holiday and expects to remain at a low level during July and part of August. Building construction during June forged ahead of May due to extensive awards in the public works and utilities group. Check payments made the usual rebound for the mid-year, while commercial loans and currency circulation increased sharply.

—The Business Week, July 15.

Model Studies Planned for San Francisco-Oakland Bridge

With the signing of three bills by Governor Rolph, of California, on May 25, the way was cleared for actual preliminary design studies for the San Francisco-Oakland Bay bridge. One of the bills appropriates the sum of $650,000 for the purpose of preliminary engineering and design of the bridge, while of the other two, one amends the toll bridge law and the other stipulates that the department of public works may accept and adopt this bridge as a state highway for purposes of maintenance. The appropriation of $650,000 will not become available until Aug. 15, but in the meantime plans are being made for model studies of suggested designs at the University of California at Berkeley. According to announcement of Charles H. Purcell, state highway engineer, Prof. George E. Beggs of Princeton University will conduct the tests.

Studies and plans of numerous types of bridges have been made and preliminary cost estimates determined. Types studied involve cantilever and suspension structures, but most recent design thinking has involved suspension spans of various arrangements. According to present plans, three different models of suspension spans for that portion of the bridge between San Francisco and Goat Island will be made. The distance to be spanned is about 10,000 ft. One proposed structure involves two single-span suspension bridges (each main span 2,360 ft. and 1,000-ft. side spans), with a common gravity anchorage common to the two bridges at the center of the channel. The two other designs are for multiple-span suspension bridges, one with three spans of 2,360 ft. each and the other with two spans of 3,500 ft. each. A 200-ft. clearance height is proposed for all of the designs.

The model work will deal primarily with stresses and deflections in the cables and towers. Working on a scale of 1 to 100, the 10,000-ft. distance between the Goat Island and San Francisco anchorages will require a model 100 ft. long. The model will be constructed of steel wire with piano wire hangers. It is desired to complete the model tests within a two-month period.

Bethlehem Acquires Kalman Steel Co.

Announcement was made last week by Eugene G. Grace, president, Bethlehem Steel Corp., that the Kalman Steel Co., Chicago, one of the leading fabricators and distributors of steel reinforcing bars, had been purchased by Bethlehem and will be operated as a subsidiary company in much the same manner as is McClintic-Marshall. It is reported that P. J. Kalman, president of the organization, will continue in his present position.

Kalman Steel Co. has long purchased its principal tonnage of bars from Bethlehem, which it has fabricated in plants at Chicago, Buffalo, New York City, Boston, St. Paul, Minneapolis, Youngstown and Niles, Ohio. Warehouse facilities are maintained in numerous other cities. As of Dec. 31, 1929, Kalman reported assets of about $5,000,000.

Abandonment of Mulholland Reservoir Considered

Members of the Los Angeles city council have requested a report from the board of water and power commissioners on the proposal that the Mulholland reservoir and dam in the Hollywood, Calif., hills be abandoned as a part of the Los Angeles municipal water system. James M. Hyde, councilman representing the Hollywood district, claims that the reservoir is a constant menace to lives and property.

On April 15 the board of water and power commissioned a board of consulting engineers consisting of B. F. Jakobsen, Charles T. Leeds and Allan E. Sedgwick to make a study and report on an adequate substitute water supply for the Hollywood district without use of the Mulholland reservoir, and also to investigate the stability of the Mulholland dam. The consulting board is expected to report soon.

Hoover Dam Notes

Final location of the diversion tunnels for the Hoover Dam project was fixed during the week ended July 4. Tests are in progress on the stoney gate type of spillway. Basalt was encountered at a depth of 352 ft. on the site of the Arizona spillway. During this drilling the cores were examined by Dr. F. L. Ransome, of the University of Arizona.

Six Companies, Inc., now has 1,250 men at work at Boulder City and at its Cape Horn camp. Difficulty is being experienced in maintaining efficiency because of extreme heat. There have been a number of prostrations and four deaths thus far.

The period for filing applications for permits to build in Boulder City expired June 30. In all, 306 applications were submitted. Appraisal of the lots will be started at once and leases made as rapidly as possible.

Bids will be opened Aug. 10 on the administration building, dormitory and municipal building.

Two shifts are working on the presedimentation basin and intake for the water system. The forms are being erected for the main basin and pumping plant No. 1. Installation of the sump tank continues to be delayed by the heat. All work is being done at night. The heat also is slowing up the laying of pipe for the water system. The laying of pipe, however, was to have been completed July 10. Concrete is being poured at pumping plant No. 2. Designs for the water-treating plant are complete. The advertisement calling for bids will be issued the latter part of July. Specifications for the sewerage system are nearing completion and bids will be advertised for before the end of the month. Construction of the 2,300-volt line was to have been completed July 9. Power will be available in Boulder City July 18, it is estimated. The Boulder City-Hoover Dam highway will be complete and the surface entirely oiled by the end of the week of July 13.

Cities Given Time to Ratify Hoover Dam Power Contracts

An extension of four months' time in which to ratify Hoover Dam power contracts with the government has been granted Pasadena, Calif., and ten other allottees by Secretary of the Interior Wilbur, according to Harold P. Huls, Pasadena city attorney and chairman of the legal committee of smaller city allottees. Other cities in this group are Burbank, Glendale, Beverly Hills, Fullerton, Anaheim, Newport Beach, Riverside, Colton, Santa Ana and San Bernardino, as originally designated. In the original allocation of power by contract of April 26, 1930, cities in southern California other than Los Angeles were allocated 6 per cent of the power to be generated, or 39,000 hp.

Announcement was made by Mr. Huls that Hoover Dam power contracts of the smaller allottee cities may be signed at any time now, but will not be binding unless ratified by a two-thirds vote of the electors of the interested communities by Nov. 15.

Wide World Photo

SPEEDING UP NEW YORK CITY'S TRAFFIC

Second section of the West Side elevated highway, running from 60th St. to 70th St., New York City, is rapidly nearing completion. The foundation work has been finished, and the steel construction work is now well under way. The first section, from Canal St. to 23d St., is now in use and when this second section of the highway is completed, a new southerly outlet for Riverside Drive traffic will be provided, alleviating congestion on the West Side of the city.

Work on Eleven-Mile Canyon Dam Year Ahead of Schedule

Eleven-Mile Canyon dam, on Platte River, which will provide an additional 80,000 acre-ft. for Denver's water facilities, is to be completed during the fall of 1931 instead of 1932, according to C. C. Schrepferman, general manager, water commission. All work preliminary to actual pouring of 65,000 cu.yd. of concrete into forms has been done. When finished, the dam will be 140 ft. high and will create an artificial lake more than 6 miles long and 1½ miles wide.

The $1,000,000 project is located on the east fork of the Platte River. Several miles of federal-aid highway between Idlewild and Hartsel, Colo., will be inundated during the next four years when floodwaters are impounded.

Concrete Pavement Yardage

There is given below a tabulation of concrete pavement yardage awarded in the United States during the month of June, divided according to roads, streets and alleys, and the totals for the six-month period ended June 27, 1931.

	During June	To June 27
Roads	13,535,625	80,668,245
Streets	2,310,765	10,825,795
Alleys	110,745	413,990
Total	15,957,135	91,908,030

To Study Management Problems of the Smaller Industries

The first conference on the management problems of the smaller industries will be held at Silver Bay, on Lake George, N. Y., Aug. 10-15. The chairman of the conference organizing committee is Harold F. Browne, of the National Industrial Conference Board, who announces, in explaining the purposes of the meeting, that "it is intended to provide an opportunity for executives of smaller plants to meet and study jointly a number of important industrial problems as they affect operation in the smaller units of industry, and all addresses and discussions will be given from the small point of view."

Ross Reinstated at Seattle as Mayor Is Recalled

By a 3 to 2 vote the citizens of Seattle, Wash., on July 13 recalled Mayor Frank Edwards as the result of charges of incompetency brought up following his dismissal of J. L. Ross, superintendent of the city light department for more than 25 years. (*ENR*, March 19, 1931, p. 496.) On the following day the city council, charged by law with the responsibility of selecting a successor to the deposed mayor, elected Robert Harlin to the post and reinstated Mr. Ross in his old position.

The controversy thus settled has been causing a bitter factional fight in the city, public opinion apparently regarding the dismissal of Mr. Ross as an attack upon the municipal ownership of utilities. Since his dismissal Mr. Ross has been consultant for New York on the St. Lawrence power development.

WASHINGTON NOTES

By PAUL WOOTON
Washington Correspondent

Status of St. Lawrence Waterway Treaty With Canada—Railroad Is Condemned for Reducing Wages

THAT the drafting of a treaty for undertaking construction of the St. Lawrence waterway will be attempted by the diplomatic representatives of the United States and Canada rather than by a joint commission appointed for the purpose has not been officially confirmed but appears to be probable. This government leans to the commission plan of negotiation, but President Hoover is not likely to quibble on the manner of approach if the dominion government feels that direct negotiation is the quickest means to an understanding that will permit the work to go ahead.

The joint engineering board has reached substantial accord and the decision whether there shall be a one-stage or two-stage development, although fundamentally an engineering problem, has political implications that would be much less formidable and more quickly reconciled by William Duncan Herridge, the Canadian minister, and Hanford J. MacNider, the American minister, than by a large board of commissioners. That Canada is ready to proceed without further delay is confirmed by the report that Minister Herridge has been given full authority by Premier Bennett to initiate the negotiations. It is understood that Canada believes the present to be a favorable time to seek agreement on the project. This is in harmony with President Hoover's desire to conclude a treaty that may be presented to the Senate next December for ratification.

Board Condemns Railroad for Reducing Wages

The management of the Louisiana & Arkansas Railway is held responsible for the controversy with its employees on wages and working conditions by an emergency board that has been reviewing the case. The board recommends that the road restore to the shopmen the rate of wages and rules governing working conditions that prevailed prior to Feb. 9, when the road made changes that, according to the board, were "positively illegal" because the railway labor act requires 30 days' notice. There is nothing in the financial situation of the road, said the board, which justified the reduction of 5c. per hour in the wages of the shopmen, and the refusal of the carrier to arbitrate on the new rules, which eliminated provisions for dealing with the union, was not warranted.

Extension Sought by Railroad

Because of the refusal of the Fredericksburg & Northern Railroad to sell its line from Fredericksburg to Fredericksburg Junction, Tex., at a price that the Southern Pacific is willing to pay, the Gulf & West Texas Railway, subsidiary of the Southern Pacific, has applied to the Interstate Commerce Commission for permission to construct a 28.6-mile extension from a connection with the Kerrville branch of the San Antonio & Aransas Pass Railway at its crossing of the Guadalupe River north to a connection with the projected line of the Gulf & West Texas in Fredericksburg.

Switching Charge Sustained

By a vote of 6 to 5, the Interstate Commerce Commission has affirmed its previous finding that the practice of line-haul carriers serving Mobile in compelling shippers to pay a switching charge on non-competitive traffic consigned to the state docks is not in violation of the interstate commerce act. The commission dismissed the complaint of the state docks commission claiming that refusal of the roads to absorb this charge is both unreasonable and discriminatory. If this contention were sustained, said the commission, line-haul carriers everywhere would be required to absorb the switching charges of terminal carriers other than those participating in the line haul. The commission held that there is no unlawful discrimination in the situation where a terminal carrier is treated exactly the same as other competing terminal carriers in the absorption or non-absorption of switching charges on a like kind of traffic. Commissioner Eastman dissented from the ruling of his colleagues and wrote a minority opinion.

SOCIETY CALENDAR

AMERICAN ASSOCIATION OF STATE HIGHWAY OFFICIALS, Washington; annual meeting, Sept. 28-Oct. 1, Salt Lake City.

AMERICAN PUBLIC HEALTH ASSOCIATION, New York; annual convention, Montreal, Sept. 14-17.

AMERICAN SOCIETY OF CIVIL ENGINEERS, New York City; fall meeting, St. Paul, Minn., Oct. 7-9.

AMERICAN SOCIETY OF MUNICIPAL ENGINEERS, St. Louis; meeting, Oct. 19-26, Pittsburgh.

AMERICAN WELDING SOCIETY, New York City; fall meeting, Oct. 21-25, Boston.

INTERNATIONAL CITY MANAGERS ASSOCIATION, Chicago; annual meeting, Oct. 7-10, Louisville, Ky.

INTERNATIONAL ASSOCIATION OF PUBLIC WORKS OFFICIALS, Chicago; conference, Sept. 24-26, New York City.

NATIONAL MUNICIPAL LEAGUE, New York City; annual meeting, Nov. 9-11, Buffalo, N. Y.

NATIONAL SAFETY COUNCIL, New York City; twentieth annual safety congress, Chicago, Oct. 12-16.

NEW ENGLAND WATER WORKS ASSOCIATION, Boston; annual convention, Sept. 29-Oct. 2, Boston.

NEW ENGLAND WATER WORKS ASSOCIATION nominating committee has submitted the following list of nominees for officers to be voted on by letter ballot: president, George C. Brehm, Boston; vice-president, E. Sherman Chase, Boston; treasurer, Albert L. Sawyer.

WEST SHORE WATER PRODUCERS' ASSOCIATION held its fourth monthly meeting July 8 at Sheboygan, Wis. About 30 superintendents, filter operators and waterworks officials of municipalities on the west shore of Lake Michigan met in May in Racine and formed an informal organization for the purpose of visiting one another's plants and exchanging operating experiences. Within the last few years many new filtration plants, pumping stations and the elaborate testing station at Chicago have been installed. At Sheboygan John R. Baylis, chemist of the Chicago bureau of engineering, talked on "Filter Bed Troubles," and W. W. De Berard, associate editor of *Engineering News-Record*, presided over a symposium on "Leaks." The next meeting will be held Aug. 12 at the Chicago testing station. The September meeting will be held in Racine in conjunction with the Wisconsin section, American Water Works Association. J. J. McCarthy, chemist, Racine water department, is chairman of arrangements and J. C. Zufeld, engineer in charge of filtration and pumping, Sheboygan, is secretary.

To Investigate Los Angeles Water and Power Bureaus

Appointment of a special committee of nine citizens to conduct a thorough investigation of operations of the Los Angeles department of water and power in order to put at rest rumors concerning the department and particularly concerning the power bureau was made June 29 by John C. Porter, mayor of Los Angeles. The committee consists of Oscar Lawler, attorney; George J. Kurtz, president, Los Angeles Railway Corp.; George V. Brock, president Brock & Co., jewelers; C. J. Thorson, former banker; Merritt H. Adamson, president, Adohr Creamery; William A. Simpson, president, Simpson Construction Co.; G. D. Robertson, president, Los Angeles Realty Board; E. J. Fleming, president, Downtown Business Men's Association, and Victor H. Rossetti, president, Farmers' and Merchants' National Bank.

Mayor Porter in his message to the city council announcing the appointments said:

> I believe the citizens of Los Angeles should know the truth of the condition of these municipally owned enterprises. Therefore, I, as chief executive of this city, am satisfied that the time has come for a complete investigation of the water and power bureaus. This morning I have drafted for civic service a special committee of nine prominent citizens of the city of Los Angeles, and have appointed them with unlimited authority to make a complete and thorough investigation of both the water and power bureaus and also the acts of all of the members of the commission. That no question can be raised relative to any recommendations and findings made by this committee I have appointed particularly outstanding men of proved business ability and loyalty to the city of Los Angeles. I urge you, as members of the legislative branch of our government, as councilmen, as citizens and taxpayers, to support this committee in its investigations, its findings and its recommendations.

Following close upon the announcement of the appointment of the mayor's committee the city council ordered an investigation of the department of water and power and a committee of three of its members was appointed, with power to subpœna witnesses and demand documents.

Financing Is Light in the First Half Year

Net corporation and long-term public financing in the first half of 1931 totaled only $2,109,000,000, compared with $4,123,000,000 in the first half of 1930. All groups except public participated in this 51 per cent drop, as the accompanying table shows. Long-term public bond issues show an increase of 12 per cent over last year's volume.

The total for June was $249,000,000, consisting of 130 millions corporation and 118 millions public. This compares with a total of 556 millions in June, 1930, of which 418 millions were corporation issues and 148 millions were public. Among the long-term issues were $3,904,000 New York Central 4½s, to yield 2 to 3.95 per cent, for new equipment; $2,595,000 New York, New Haven & Hartford 4½s, to yield 2.25 to 4.15 per cent, for new equipment; $3,200,000 Central Illinois Public Service Co. 4½s, at 92, for extensions and additions; $15,016,000 Detroit Edison Co. 4½s, to yield 4.28, for new additions; $21,000,000 Safe Harbor Water Power Corp. 4½s, at 96.5, for working capital. Among the real estate flotations were three, of $75,000, $125,000 and $225,000, the first two at 6 per cent and the third at 5½ per cent.

The Sun Oil Co. issued $4,000,000 three-year 5 per cent notes for plant improvements at 99¼.

In June 385 municipalities issued bonds to the number of 500 separate issues. The average rate for these was 4.44 per cent and the yield 4.23 per cent.

	Millions in Six Months		Per Cent
	1931	1930	Drop
Railroads	273	647	58
Utilities	716	1,714	58
Metals	105	161	35
Equipment	12	20	40
Motors		7	
Other manufacturing	101	399	75
Oil	15	231	94
Land, buildings	37	150	75
Rubber		31	
Shipping	2	10	80
	1,261	3,375	63
Public, long	838	748	+12
	2,099	4,123	51

Wages in Boise, Denver and Anderson, Ind.

Union rates and wages actually being paid are given in the accompanying tabulation for the cities of Anderson, Denver and Boise. Similar data have already been given for 63 cities in the issues of June 4, 11 and 18.

Conditions are slow in Anderson and some union workers are receiving less than the scale. At Boise wages are 30 per cent below the scale. Farmers are paying $1.50 to $2 per day for haying hands. At Denver actual wages are three-quarters of the official scale. On city work 50c. per hour is being paid union labor. On private work 50c. is the prevailing rate, with cases of 30c. to 37½c.

	Anderson, Ind.		Denver		Boise	
	Official	Actual	Official	Actual	Official	Actual
Carpenters	$0.90	$0.80@$0.85	$1.25	$0.75@$0.87½	$1.00	$0.75
Bricklayers	1.10	0.90	1.50	1.00@1.12½	1.50	0.94
Plasterers	0.95	.....	1.50	1.00@1.12½	1.37½	0.75
Ironworkers	1.10	.....	1.25	0.75@0.87½	1.00	.....
Common laborers	0.45	0.35	0.50@ 0.62½	.....	0.50	0.50

Some Cost Figures in New York City

Half a dozen New York contractors have furnished *Engineering News-Record* with data on wages, materials prices, and unit costs in the city. Without exception these contractors are paying the scale for skilled workers. One contractor is paying 50c. per hour for common labor and another is paying 60c. The contractor who pays 50c. gives 80c. as his rate for form-workers and 60c. for semi-skilled. A builder of refuse-disposal plants is paying a minimum of 25c. and a maximum of 65c., and for semi-skilled labor $1.23¾ per hour.

The lowest price of structural timbers is $30, and two contractors quote $34 and $35 for fir. The price for cement ranges from $1.54 to $2.40. Common brick is $12.

One contractor gives 8½c. per block as the price he is paying for 4-in. hollow tile.

Two contractors furnished some unit costs. One gives $150 per ton for structural steel erected, $12 per cubic yard for reinforced-concrete building foundations, and $4 per square yard for 9-in. reinforced-concrete paving. The other gives $70 per ton for steel erected; $22 to $27 per cubic yard for foundation concrete.

Data were furnished also by a contractor of Elmhurst, a town on Long Island 7 miles from Manhattan. The union scale is being paid, with such exceptions as 90c. per hour for woodform workers, 75c. to $1 for semi-skilled, and 60c. to 75c. for common labor. Prices for materials delivered on the job are given as follows: $69 per ton for structural steel, $39 per 1,000 ft. b.m. for structural timber, $1.80 for cement without bags, 9c. per block for hollow tile and $16 for common brick.

COSTS AND CONTRACTS

ENR Index Numbers

Cost			Volume		
July 1, 1931	174.37	June,	1931	243
June 1, 1931	187.37	May,	1931	251
July 1, 1930	200.95	June,	1930	324
Average, 1930	202.85	Average,	1930	260
Average, 1929	207.02	Average,	1929	317
1913	100.00	1913		100

This Week's Contracts

Heavy construction contracts, reported by *Engineering News-Record* in the week of July 16, with some comparisons, total as follows:

(In Thousands of Dollars)

	July 16, 1931	Average of Last Four Weeks 1931	1930
Buildings:			
Industrial	$1,108	$2,440	$6,280
Other	7,621	14,200	26,400
Streets and roads	10,316	13,000	15,800
Other construction	15,025	14,600	13,400
Total	$34,070	$44,240	$61,880

Total, all classes, Jan. 1 to July 16:

1931	$1,535,759
1930	2,028,172

Personal Notes

ROBERT VANCE ORBISON, city manager at Pasadena, Calif., for the past six years, has submitted his resignation to the city board of directors, to become effective not later than Sept. 1, this year. The resignation was accepted by the board.

J. S. MCBRIDE, valuation engineer of the Chicago & Eastern Illinois Railway, has been appointed chief engineer, succeeding L. C. Hartley, who has retired on account of ill health. The position of valuation engineer is abolished, but the duties will be assumed by the chief engineer.

LEROY C. HULBURD, senior assistant engineer for the Rochester district of the New York state department of public works, has been appointed assistant engineer of canals and waterways in New York State, with headquarters in Albany. Mr. Hulburd went to Rochester twelve years ago as an employee in the supervision, construction and maintenance of the Barge Canal.

CHARLES A. ENGLE, for the last seven years supervising engineer of district No. 2 of the United States Indian irrigation service, department of the interior, with headquarters in Salt Lake City, has been promoted to the position of acting assistant to the director of irrigation in Washington, D. C. Mr. Engle has been succeeded by LESTER M. HOLT, of Yakima, Wash., who has been supervising engineer of district No. 2 and who has been transferred to Salt Lake City. Mr. Holt has been placed in charge of combined districts 1 and 2, now known as district 2.

Obituary

PASCAL O. DIETRICK, city engineer of Niagara Falls, N. Y., died in that city on July 8 from injuries received in an automobile accident on June 8 while en route to the New York state mayors' conference at Glens Falls, N. Y.

JOHN LYONS AGNEW, vice-president of the International Nickel Company of Canada, Ltd., died at his home in Copper Cliff, Ont., July 8. Mr. Agnew was in charge of the company's operations in both Canada and Great Britain.

Construction Equipment and Materials

Two Traveling Gantry Cranes With Luffing Booms

Modern tendencies in large-scale material-handling methods are exemplified in two large gantry cranes for the ship-to-shore transfer of bulk materials recently placed in service. Both are equipped for electric operation, with provision for raising the overhanging booms to facilitate the docking of vessels. The illustration on the left shows a unit designed and built by the Cleveland Crane & Engineering Co., Wickliffe, Ohio, for the U. S. Phosphoric Products Corp. at East Tampa, Fla. It has a rated capacity of 7½ tons, an over-all height of 77 ft. and an over-all length, with boom in horizontal position, of 150 ft. It is equipped with a 3-cu.yd. Blaw-Knox Dreadnaught bucket which is lifted at a speed of 150 ft. per minute, the holding line and closing line hoists being driven independently by two 80-hp. motors. A 30-hp. motor drives two hoisting drums near the top of the A-frame which can raise the overhanging boom at the rate of 5 ft. per minute. After erection, all riveted steel connections on the crane were arc welded to insure permanent alignment and to impart additional strength and rigidity.

The crane on the right was designed and built by the Wellman Engineering Co., Cleveland, Ohio, for the Western Maryland Railway on Pier 6, Port Covington, Baltimore, Md. It is of the self-propelling, full portal gantry, man trolley type, with a hinged horizontal cantilever on each side overhanging the water. The trolley is equipped with a multiple rope, heavy-duty 9-ton bucket which discharges into a traveling receiving hopper fitted with a motor-operated gate. This, in turn, delivers the material into a traveling hopper carried on scales, where it is weighed and discharged through a second motor-operated gate directly into open railway cars or into box car loaders, one of these being mounted on each main sill.

The crane is carried on 24 spring-mounted wheels, half of which are driven by two motors through gears and shafting. A total of seventeen motors with a combined horsepower of 855 is used for the various crane motions. All of these are operated by 550-volt, three-phase, 25-cycle alternating current with the exception of the bucket hoist, which operates on 230-volt direct current supplied by a motor generator set. Car pullers for spotting cars are located at each corner of the crane. Its principal dimensions are: span, center to center of crane tracks, 57 ft. 10 in.; trolley travel, 163 ft. 10 in.; height from top of pier rail to top of trolley runway, 73 ft.; lift above pier rail, 52 ft.; lift below pier rail, 46 ft.

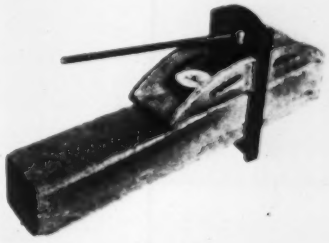
Pipe Fittings for Welding

Installation of completely welded pipe systems using circumferential welds only is made possible by the development of a complete line of seamless steel pipe fittings consisting of elbows, tees, reducing tees, bull plugs and reducing nipples by the Taylor Forge & Pipe Works, P. O. Box 485, Chicago, Ill. These are now available in sizes up to 12-in. diameter and will soon include sizes up to 24 in. They are lighter in weight than ordinary cast-steel fittings, require less space in erection and permit easy and economical installation. Elbows are made without thinning or buckling of the walls and include short tangent sections to facilitate welding and accurate lining up. The ends are machine tool beveled, providing a smooth, clean surface for welding.

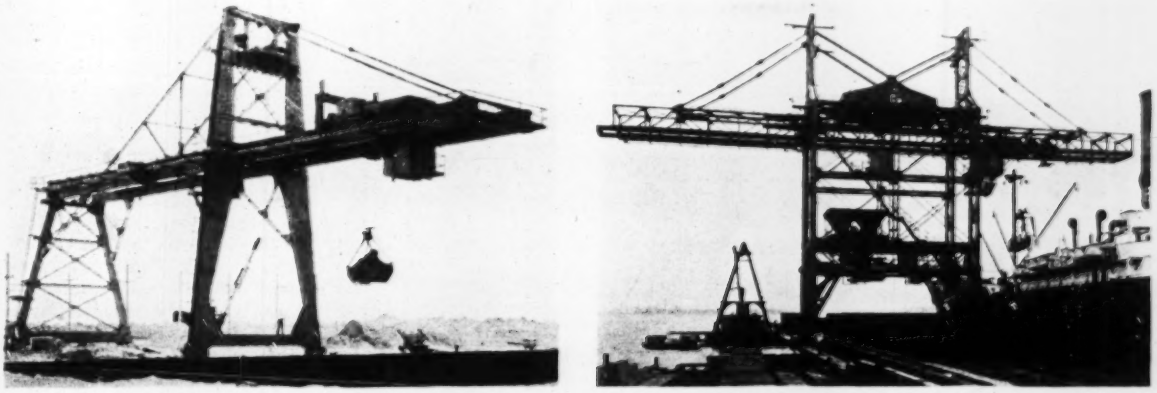
Portable Machine for Testing Concrete Beams

Designed for testing concrete used in highway construction, a portable transverse testing machine which weighs only about 40 lb. but is capable of exerting a force of 4,000 lb. has been developed by and can be purchased from Prof. Herman C. Berry, of the Towne Scientific School, University of Pennsylvania, Philadelphia, Pa. The machine is unique in that it satisfies all technical requirements for strength and accuracy and at the same time is light enough to permit an inspector to move it readily from one job to another. It consists of an aluminum alloy frame having a fixed point bearing at one end and a slightly movable point at the other end, so as to prevent the introduction of restraining stresses on the tension side of the beam during loading. On this frame is mounted a small hydraulic pressure cell, on one side of which is a flexible brass diaphragm 0.01 in. in thickness. This chamber is filled with oil and connected to a common pressure gage which is graduated to record the pounds of load on the diaphragm. A metal disk floats in this diaphragm. Bearing on the disk is a rotating shaft which is threaded at the upper end so as to raise and lower a cross-member to which a similar cross-member below the beam is attached by two links. This lower cross-member is pulled upward by the links against the beam. The

(Continued on p. 120)



Portable concrete-testing machine



Traveling gantry cranes for unloading bulk materials from ships

Current Construction Unit Prices

Vertical Fiber Brick Pavement, Akron

CONTRACT was awarded in May, 1931, for completing the repaving and widening of East Exchange St., Akron, Ohio. This will provide another thoroughfare to the East Akron factories. Principal unit prices are given of the lowest three bidders: A, Paul S. Maline, 52 Hoover St., $151,466 (contract); B, Hallinger-Davidson Co.; C, T. E. McShaffrey Construction Co.

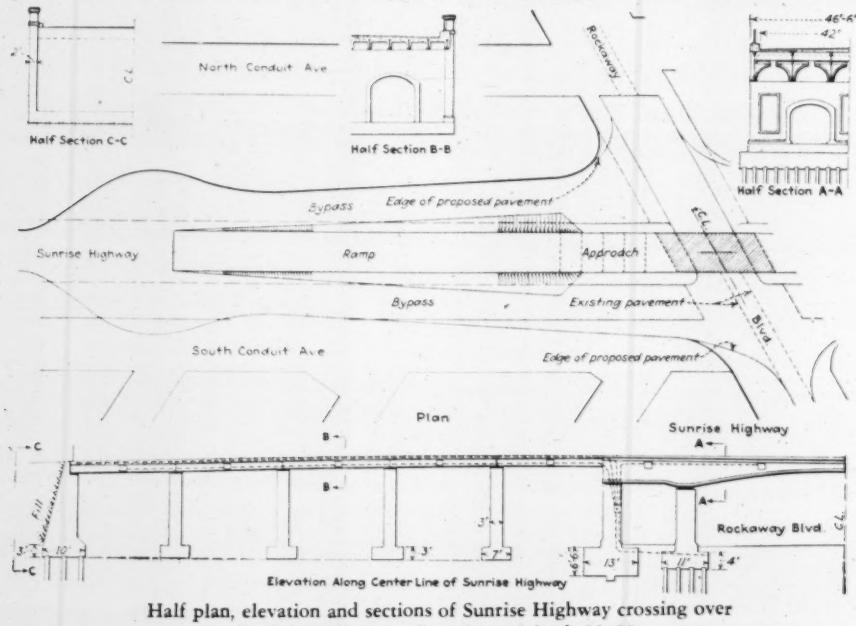
	A	B	C
14,100 cu.yd. grading	$0.30	$0.50	$0.35
9,800 ft. 4-in. underdrain	.08	.10	.10
1,430 ft. inlet connections 12-in. pipe	.95	1.00	1.00
665 ft. 12-in. drain	1.37	2.90	2.50
200 ft. 15-in. drain	2.65	3.60	2.60
7,600 ft. 6-in. house drain	.80	1.00	1.60
1,000 cu.yd. conc. base	5.50	6.00	6.00
4,300 ft. sandstone curb 6x18 sq.in.	1.35	1.40	1.30
4,460 ft. curb reset	.50	.50	.70
26,400 sq.yd. conc. base:			
5-in.	.84	.90	.80
6-in.	.97	1.00	.95
7-in.	1.11	1.16	1.10
8-in.	1.60	1.35	1.25
35,400 sq.yd. curing base	.02	.03	.02
35,400 sq.yd. repressed brick pavement	1.90	1.90	1.95
35,400 sq.yd. 3½-in. V. F. brick	1.70	1.70	1.80
28,400 sq.yd. Trinidad sheet asphalt	1.25	.....	1.15
28,400 sq.yd. Texas sheet asphalt	1.10	.....	1.00
62,000 sq.ft. 1-course cement walk	.15½	.16	.15
62,000 sq.ft. 2-course cement walk	.16½	.16	.15
9,500 sq.ft. 1-course driveway	.18½	.19	.18
10,000 lb. reinf. steel	.03	.03	.03½
Totals			
Repressed brick pavement, 6-in. base	$153,081	$158,027	$159,340
3½-in. vert. fiber brick, 6-in. base	147,771	150,947	152,260
3½-in. vert. fiber brick, 7-in. base (contract)	151,466	.....	.....

Sunrise Highway Crossover, Queens Borough, N. Y.

CONTRACT was let in March, 1931, for a steel-girder bridge and approaches to carry Sunrise Highway over Rockaway Boulevard in the borough of Queens, New York City. The project consists of two earthfill ramps 430 and 415 ft. long, two 124-ft. steel-on-concrete approaches and the 116-ft. span. Roadway width is 42 ft. The ramps are to be paved with bituminus macadam, the approaches and bridge with concrete. Rockaway Boulevard is to be paved with sheet asphalt for a width of 60 ft. Contractor agrees to maintain the asphalt pavement for five years, and the concrete pavement for one year. Paving concrete is 1:3:6. The drawing shows a half plan and elevation of the project.

Twelve bids were received, and unit prices are given of the lowest three: A, Tully & DiNapoli, Inc., 30-11 Sherman St., Astoria (contract); B, Welsh Bros. Contracting Co., Inc.; C, W. H. Gahagan, Inc. The work is to be completed in 250 days.

	A	B	C
500 cu.yd. excav.	$1.00	$0.75	$2.06
55,000 cu.yd. embank. in excess of excav.	.20	.30	.44
1,100 lin.ft. new bluestone headers	1.10	2.00	1.40
80 lin.ft. new granite corner curb	3.75	4.00	3.85
150 lin.ft. new straight granite curb	2.75	4.00	3.02
600 sq.ft. cement sidewalk	.25	.30	.31
350 cu.yd. 8-in. concrete	6.75	9.00	14.70
100 cu.yd. conc. in place in forms 1:2½:5	5.58	11.50	8.16
100 cu.yd. conc. in place in forms, 1:2:4	5.37	15.00	19.21
1,560 sq.yd. completed sheet asphalt pavement	1.10	1.50	1.41
21,000 sq.yd. completed bituminous macadam pavement	1.35	1.50	1.69
800 sq.yd. stone gutters	1.30	2.00	1.81
400 lin.ft. 12-in. vitr. pipe	1.20	2.00	1.22
6,000 cu.yd. steam cinders	1.23	1.40	2.35
10 cu.yd. broken stone, 2½-in.	3.75	3.15	4.60
400 cu.yd. loam	1.00	1.50	1.80
30,600 sq.ft. sod	.04	.05	.055
5 tons reinforcing steel	75.00	80.00	81.00
4,000 lin.ft. cable railing	.65	1.00	.66
Viaduct complete in place, except excav. for piers	130,738.30	119,000.00	113,000.00
Total	$192,133	$197,226	$208,485



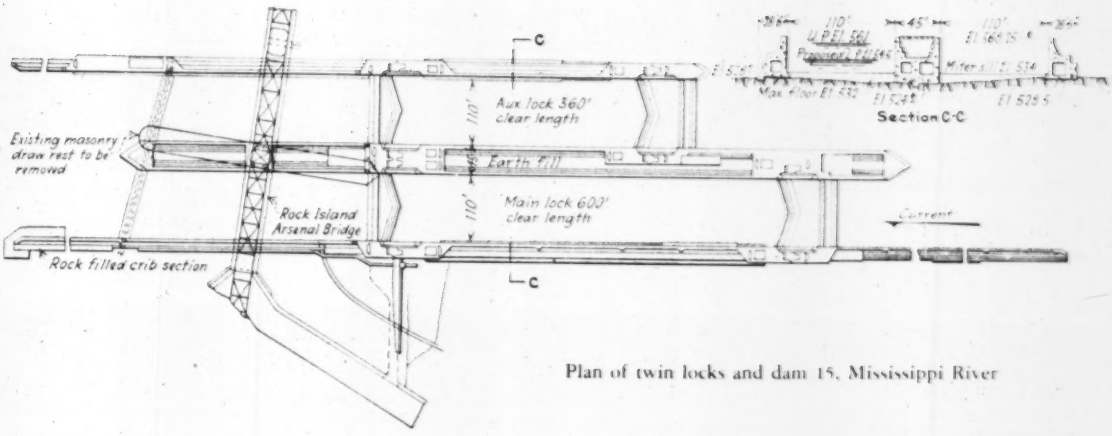
Half plan, elevation and sections of Sunrise Highway crossing over Rockaway Boulevard on Long Island, N. Y.

Lock and Dam 15, Mississippi River

WORK of constructing two parallel and connected locks, including guides and guide walls, and the removal of the guide pier of the drawspan of an adjacent railway and highway bridge was placed under contract by the U. S. Engineer Office at Rock Island, Ill., in March, 1931. The locks are 110x600 ft. and 110x360 ft. Length of the upper guide wall is 600 ft. and of the lower guide wall 1,100 ft. Over-all length of the main lock and guide wall is 2,500 ft.

The locks are located immediately upstream from the Rock Island-Davenport bridge, the middle wall of the lock connected with the rest pier of the swing span. This bridge carries the main line of the Rock Island Railroad on the upper deck and street cars and vehicles on the lower deck. River traffic passes on either side of the west pier. Clear openings are 162 ft.

In constructing the locks, river traffic must be maintained through one of the spans of the drawbridge. These conditions require two main cofferdams. The first or inner cofferdam incloses the inner lock with the rest pier, leaving openings for river traffic. The outer arm of this cofferdam serves as a guide wall for boats passing through the bridge and must be of steel piling or crib construction or a combination of the two. Other parts of the cofferdam are of box type. The two cofferdams are 13 ft. high. Payment for the cofferdams is on the basis of the number of linear feet of permanent work inclosed by them. Linear feet of masonry



Plan of twin locks and dam 15, Mississippi River

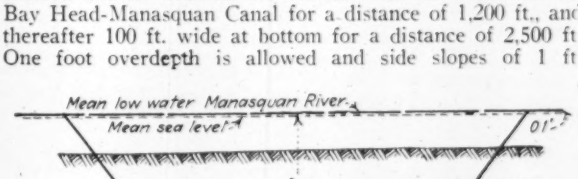
in the first cofferdam is 1,798 ft.; in the second cofferdam, 1,090 ft. The unit prices range from $31 per linear foot as estimated by the successful contractor for the whole work, to $150.

Twenty bids were received, ranging from the contract price of $1,326,472 to a high of $2,110,016, with an average of $1,741,200. Contract price is 24 per cent below the average of the twenty bids, and 11 per cent below the second bid. Unit prices are given on the lowest three bidders: A, Merritt-Chapman & Whitney Corp., Duluth, Minn.; B, Walsh Construction Co., Davenport, Iowa, $1,382,689; C, Winston Bros Co., Minneapolis, $1,551,272. Major G. E. Edgerton is district engineer.

	Quantity		A	B	C
Cofferdam per foot of permanent work inclosed	2,887.5	lin.ft.	$31.00	$64.70	$100.00
Common excavation	76,000	cu.yd.	.55	.465	.50
Rock excavation	40,000	cu.yd.	1.85	1.15	1.20
Fill	58,000	cu.yd.	.25	.25	.48
Rock channeling	42,000	sq.ft.	.45	.82	.80
Derrick stone and riprap	7,900	cu.yd.	1.50	1.20	2.00
Round piling	11,000	lin.ft.	.40	.40	.60
Oak timber	45.1	M.ft.b.m.	90.00	165.00	250.00
Common timber	391.8	M.ft.b.m.	50.00	52.00	76.00
Concrete	128,175	cu.yd.	6.05	5.60	6.00
Structural steel	1,639,300	lb.	.06	.061	.065
Forgings	143,700	lb.	.15	.115	.115
Bolts	25,300	lb.	.08	.09	.12
Reinforcing rods	445,800	lb.	.035	.033	.034
Iron castings	48,700	lb.	.05	.067	.09
Steel castings, class A	1,134,000	lb.	.05	.07	.055
Steel castings, class B	96,830	lb.	.10	.11	.13
Nickel steel	6,500	lb.	.20	.25	.25
Bronze	3,850	lb.	.35	.37	.60
12" vit. clay pipe drain	1,400	lin.ft.	.50	1.25	.55
36" concrete sewer	475	lin.ft.	4.00	4.75	4.30
48" concrete sewer	1,800	lin.ft.	6.00	8.10	6.75
3" fiber conduit	41,000	lin.ft.	.15	.17	.15
4" fiber conduit	7,900	lin.ft.	.20	.23	.17
2" wrought-iron pipe	1,300	lin.ft.	.40	.70	.40
30" cast-iron pipe	204,180	lb.	.035	.08	.035
Tainter gate valves (main lock)	Lot	lb.	18,000	16,400	14,000
Tainter gate valves (auxiliary lock)	Lot	lb.	15,000	13,560	12,000
Sluice gates (2-30", 1-36")	Lot	lb.	1,200	1,225	1,350
Tile pages	Lot	lb.	400	455	560

Dredging Manasquan River Channel, New Jersey

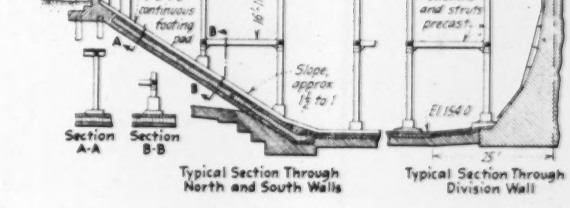
MANASQUAN RIVER, on the seaboard of New Jersey, will be dredged to a depth of 8 ft. for a channel 200 ft. wide on the bottom from the mouth of the Bay Head-Manasquan Canal for a distance of 1,200 ft., and thereafter 100 ft. wide at bottom for a distance of 2,500 ft. One foot overdepth is allowed and side slopes of 1 ft. vertical and 3 ft. horizontal. Mean tide range is only ½ ft. Material is sand and mud and is deposited on shore behind bulkheads or sod banks. Three bids were received June 23, 1931, by the state board of commerce and navigation: Trimount Dredging Co., Boston, 12.85c. per cu.yd.; Hills Dredging Corp., Ventnor City, N. J., 27.9c.; Wall Dredging Co., Avon, N. J., 28.8c.



Typical section through 100-ft. channel, Manasquan River

Reinforced-Concrete Cover for Two Reservoirs

TWO basins of the Compton Hill reservoir of the St. Louis water system are being provided with a reinforced-concrete cover. The basins adjoin and each is 415¼x502½ ft. in plan by 36.42 ft. high. There are only three items of cost: (1) concrete; (2) reinforcing steel; (3) miscellaneous cast iron, steel, brass, copper, asphalt, felt. Twenty-two


Expansion joint, 30 lb. felt mopped down with hot asphalt
Mat "B" 4½"ø, 8' long, same sps. as lower mat
Present ground line, el 180.6
El. 190.42
4'-0"x 9" continuous footing pad
Mat "A"
Columns and struts precast
El. 180.0
Slope, approx 1½ to 1
El 154.0
Section A-A
Section B-B
Typical Section Through North and South Walls
Typical Section Through Division Wall

Typical section through north and division wall of reservoirs

bids were received April 28, 1930, and contract was let to J. J. Gilmore, 844 Rush St., Chicago, for $222,440. Complete unit prices are given. E. E. Esterday is division engineer, supply and purifying section, city water division.

	Concrete 12,400 Cu.Yd.	Reinf. Steel 2,200,000 Lb.	Misc. Metals Lump Sum	Total
J. J. Gilmore	$12.350	$0.0295	$4,400	$222,440
Excavating Co., Inc	12.333	.0300	4,950	223,883
Missouri Eng. & Constg. Co	12.680	.0275	7,084	224,816
Kaplan-McGowan	12.600	.0325	3,000	230,740
Stires Bros. Const. Co	13.170	.0290	5,500	232,608
C. N. Lund	13.050	.0302	5,500	233,760
Riley Contg. Co	12.200	.0400	4,500	243,780
Bridges Asphalt Pav. Co	15.400	.0250	4,250	250,210
Frazier-Davis Const. Co	14.700	.0300	5,000	253,280
Skrainka Const. Co	13.800	.0350	6,700	254,820
W. E. Callahan Const. Co	15.000	.0330	6,000	264,600
McCarthy Bros. Const. Co	15.190	.0350	4,100	269,456
Alfred Lewald, Inc	14.500	.0400	6,000	273,800
McCormick-Combs Const. Co	16.200	.0330	5,000	278,480
Fruin-Colnon Const. Co	15.500	.0400	5,000	285,200
G. G. Prendergast	17.660	.0290	5,410	288,194
Pelligreen Const. & Invest	16.900	.0350	5,891	292,451
A. D. Gates Const. Co	17.734	.03338	3,644	296,982
Winston Bros. Co	17.450	.0350	5,800	299,180
F. H. Latham Co	17.950	.0370	4,463	308,443
H. A. Dailey Const. Co	22.500	.0334	5,170	357,650
Wimmer Const. Co	28.200	.0334	7,541	430,701
Average	15.750	.0315	5,225	300,000

Portable Beam Tester

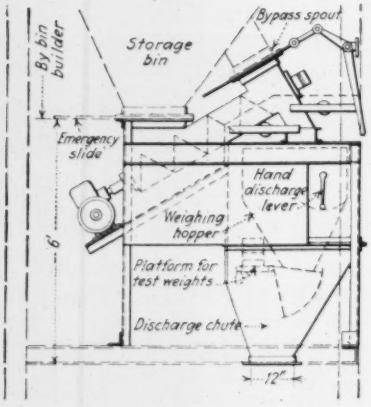
(Continued from p. 117)

reaction to the pressure exerted on the beam is transmitted to the diaphragm and hence to the gage, which indicates the breaking load by a maximum reading hand. After the breaking load has been recorded the machine can be moved about 12 in. along the concrete beam, and a second, or check, test can be made.

The ease with which the pressure can be brought to bear by the machine is evidenced by the fact that the rotating shaft can be turned readily by hand up to a point at which 350 lb. pressure is recorded. Beyond that point the use of a light capstan bar is necessary, but little physical force is required to operate the machine even when the maximum pressure of 4,000 lb. is being exerted.

Automatic Scale for Weighing Cement in Bulk

Batching loose or bulk cement from a storage bin within a tolerance of ½ of 1 per cent is the function of the duo-screw feed automatic scale manufactured by the Richardson Scale Co., Clifton, N. J. The device is made up of a structural steel framework supporting a dual-screw feeding system with complete individual motor drives, automatic scale



Elements of cement-weighing device

weighing levers, a beam box, a weighing hopper and a lower shroud. It is designed for rapid removal and transportation from one location to another, and is arranged to occupy space beneath a standard cement bin.

The scale mechanism is a tubular lever system of low multiplication. The knives are of high-grade hardened pivot steel, resting on steelings which are set in carrying brackets mounted on the framework. End pivots or knives are fixed at either end of the weighing levers. The outer end pivots support the sheet-iron weighing hopper in which the cement is weighed, while the inner end pivots are shackled together and joined through a connecting rod to the graduated main weighing beam in the beam box. The weigh beam is graduated from 0 to 1,000 lb. with 50-lb. graduations, while a subsidiary beam is graduated from 0 to 50 lb. with 1-lb. graduations. The weighing mechanism is completely housed in a beam box of channel and sheet iron, with a hinged cover which can be locked during operation.

Cement flows from the storage bin through an 18x18-in. main inlet opening to two screw conveyors arranged side by side. These consist of a standard 9-in. screw conveyor and a half-pitch 6-in. screw conveyor. Each screw is driven by an individual motor through a speed-reducing unit, current to the motors being controlled through both a pushbutton operator's switch and heavy-duty mercury switches operated by the main weighing feed. When the weighing hopper is empty and the poise weights are placed in weighing position, the pushbutton starts both motors and the weighing cycle begins. When approximately 70 per cent of the load has entered the weighing hopper, the beam automatically tilts a mercury switch and stops the 9-in. screw conveyor. The smaller conveyor completes the batch and is shut off by a second mercury switch when the proper weight of cement has been delivered. The entire feeding system is completely housed within a sheet-metal casing to prevent the escape of cement or dust. With an adequate head of cement maintained in the storage bin, the outfit is capable of completing two weighings per minute with batches ranging from 400 to 1,000 lb.

For emergency operation in case of power failure, a bypass inlet chute with hand-controlled slide type cutoff gate connects the storage bin directly with the weighing hopper.

Business Notes

DECARIE INCINERATOR CORP. announces the joining of its interests with a recent personnel of the Nye Odorless Incinerator Corp. under the name of D-N Corp., which will function as both a holding and an operating company. The new organization will be in position to furnish practically any known type of modern incineration plant, and has also acquired franchises and ownership of various types of sewage-disposal equipment. Executive offices will be at Winston-Salem, N. C., with branch offices in a number of leading cities. New officers include the following: chairman of the board, Jules Breuchaud; president, Dermot Shemwell; vice-presidents, Francis L. Pruyn and W. L. Crawford; secretary, Jules R. Breuchaud; treasurer, William C. Key.

LINK-BELT CO., Chicago, Ill., announces the retirement, after 30 years of service, of Harold H. Clark as vice-president and assistant secretary of the Pacific division of the company. He is succeeded by Ralph M Hoffman, for the past eight years manager of the Seattle office.

BLAW-KNOX CO., Pittsburgh, Pa., announces that Nicholas Gerten, formerly vice-president of the Blaw-Knox International Corp., New York City, has been elected president of that organization.

PAGE STEEL & WIRE CO., Bridgeport, Conn., has appointed C. N. Johns general manager, with headquarters at Monessen, Pa. W. H. Bleecker, Jr., is appointed sales manager, with headquarters at Pittsburgh.

BASTIAN-BLESSING CO., manufacturer of welding equipment, has elected Ellsworth L. Mills vice-president. Mr. Mills, formerly sales manager for the company, continues in charge of sales.

MCCLINTIC-MARSHALL CORP., has transferred Leslie Allen, formerly manager of the Buffalo district, to be manager of the Pittsburgh district, succeeding the late Thomas L. Cannon. J. K. Bard has been appointed manager of works of the Buffalo district.

ARMCO CULVERT MFRS. ASSOCIATION, Middletown, Ohio, has appointed Eugene Keller, Jr., regional manager for the territory from North Carolina to Texas. Mr. Keller was formerly district manager for the Philip Carey Co. at Memphis, Tenn.

HAUSER CONSTRUCTION CO., Long Beach, Calif., has been reorganized. Quarry properties at Ormond, Riverside County, will be operated by Kumpe-Hauser Corp., Ltd., to supply granite riprap to the trade. General engineering construction, especially jetty, breakwater and harbor work, will be done by Karl B. Kumpe, Ltd., a corporation. Karl B. Kumpe is president of both concerns.

GOULDS PUMPS, INC., Seneca Falls, N. Y., has made several changes in headquarters and branch office staffs. Henry L. Boyer has been appointed manager of farm-suburban sales; Henry F. Miller, manager of industrial sales; W. G. Allen, manager of engineering sales; J. B. Anderson has been placed in charge of the department of inquiry and estimate, and G. W. Cramer has been made advertising manager. Mark D. Rowe, formerly Eastern manager of Servel Sales, Inc., is now manager of the New York office; J. B. Foley has been transferred from the Pittsburgh office to the Chicago office, and Fred Jones from the Philadelphia office to the Pittsburgh office. A new branch has been opened at Dallas, Tex., in charge of Fred Hayes, manager.

FORT PITT STEEL CASTING CO., McKeesport, Pa., has appointed David Geissinger a special representative.

FUSION WELDING CORP., Chicago, Ill., has appointed the Puritan Compressed Gas Corp., of Kansas City, Mo., distributor for Weldite welding rods in the State of Kansas and the western part of Missouri.

LEIPZIG TRADE FAIR, Leipzig, Germany, will be held this fall from Aug. 30 to Sept. 3. Detailed information can be obtained from the Leipzig Trade Fair, Inc., 10 East 40th St., New York City.

INTERNATIONAL-STACEY CORP., Columbus, Ohio, has transferred E. A. McCallum, who has been in charge of the San Francisco offices, to Pacific Coast headquarters at Los Angeles, Calif.

WESTINGHOUSE AIR BRAKE CO., Wilmerding, Pa., announces that S. W. Dudley, Strathcona professor of mechanical engineering and chairman of the department of mechanical engineering at Yale University, has rejoined its engineering organization in an advisory capacity with the title of assistant to the president. Prof. Dudley will retain his university connections.

WESTINGHOUSE ELECTRIC & MFG. CO., East Pittsburgh, Pa., has appointed J. M. Hipple general works manager. He will be succeeded as works manager at East Pittsburgh by C. H. Champlain, formerly at Sharon, Pa., while M. L. Fawcett becomes works manager at Sharon. A. B. Reynders, in addition to his present duties as works manager at East Springfield, Mass., will have supervision over operations at the Mansfield works, and J. E. Barkle will supervise the Newark works in addition to those at South Philadelphia. In the sales department L. S. Washington has been placed in charge of the St. Louis and Memphis offices and the districts they serve, and E. D. Stewart of the Houston, Dallas, San Antonio and El Paso, Tex., offices.

OWEN BUCKET CO., Cleveland, Ohio, has transferred E. L. Kelzer, formerly district manager at Detroit, to the corresponding position in Chicago. He is succeeded at Detroit by W. E. Phillips.

ROBERT W. PRYOR, of Kolthan & Pryor, New York City, died July 10 after an illness lasting six months. Mr. Pryor was a graduate of Stevens Institute of Technology, being associated from his graduation in 1902 until 1909 with the Buffalo Forge Co. In the latter year he formed the partnership of Kolthan & Pryor, acting as sales engineers and representatives of the Buffalo Forge Co., the Carrier Air Conditioning Co. and the Buffalo Pump Co. Mr. Pryor was a member of the American Society of Mechanical Engineers and of the American Society of Heating and Ventilating Engineers.

CONSTRUCTION NEWS

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Some of the Week's Large Projects

For further details turn to the appropriate sections in this issue

Location	*Project*	*Cost*	*Status*
Waterworks			
Seattle	Pipe line, dam and reservoir	$2,000,000	Contract
Bridges			
Kentucky and Indiana	Bridge	1,000,000	Contract
Railways			
Colorado	Railroad	3,800,000	Proposed
Oklahoma	Track work, etc.	1,500,000	Owners forces
Dams			
San Benito (Tex.)	Storage dam	10,000,000	Proposed
Piers and Wharves			
New York	Pier	7,000,000	Proposed
Federal Government			
Washington	Supreme Court	9,740,000	Bids asked
Oahu (T. H.)	Ammunition depot	2,000,000	Contract
Factories and Mills			
Sarnia (Ont.)	Oil producing equipment	1,000,000	Proposed
Power Plants			
San Francisco	Power house	1,000,000	Proposed
Newport (Wash.)	Hydro electric plant	4,500,000	Proposed
Buildings			
Chicago	Nurses home	2,350,000	Bids asked
Springfield (Mo.)	Hospital	2,500,000	Proposed
Evanston (Ill.)	University	1,000,000	Contract
Bennington (Vt.)	College	1,000,000	Bids asked
Cincinnati	Newspaper building	1,800,000	Bids asked

WATERWORKS

PROPOSED WORK

Calif., San Rafael—Marin Municipal Water Dist. 150,000 gal. steel water tank, 25,000 to 30,000 lin.ft. 12 in. c.i. pipe lines, valves to serve Army Bombing Base at Marin Meadows.

Ind., Fort Wayne—City, waterworks improvements, incl. structures of filtration and pumping station, dam and low service pumping station, low service and high service pumping equipment, 11 mi. raw water supply main, chemical handling equipment, feeding machines. Hoad, Decker, Shoecraft & Drury, Engineering Bldg., Detroit, Mich., engrs.

Ia., Lineville — City Council waterworks, $20,000. E. T. Archer & Co., 609 New England Bldg., Kansas City, Mo., engrs.

Mass., Cambridge — Preliminary plans filter plant addition to pumping station, incl. 6 new sand filter beds, rein.-con., and new pumping station, 12 m.g.d.c., $100,000. Fuller & Everett, 25 West 43rd St., New York, engrs.

Minn., Minneapolis — City installing carbon bed for improving taste of water at filter plant, $5,000. N. W. Elsberg, city engr.

Mo., Huntsville—City waterworks improvements, $25,000. E. T. Archer & Co., 609 New England Bldg., Kansas City, engrs.

N. H., Manchester—Pub. Serv. Co. of New Hampshire, J. B. Smith, genl. mgr., 1087 Elm St., preliminary plans reservoir at Stoddard. To exceed $25,000.

N. Y., Goshen—Village water reservoir. **Maturity about October.** H. B. Cleveland, 255 Bway., New York, engr. Noted Apr. 2.

Okla., Chickasha—City Council, c/o J. Larson, 1 story, 40 x 50 ft., brick filtration plant and distribution system. $193,000. Hawley, Freese & Nichols, 411 Capps Bldg., Ft. Worth, Tex., and R. O. Bradley, Chickasha, assoc. engrs. Noted Feb. 19.

Tex., Houston — City, c/o W. E. Monteith, mayor, soon takes bids 2 m.g. concrete, brick, stone reservoir. $75,000. J. M. Nagle, city engr.

Wash., Yakima—City Council improving water works, incl. 30 mi. 6- to 12-in. c.i. pipe lines, reconstructing existing hydrants. $200,000.

Que., Sillery — City Council waterworks, $50,000.

BIDS ASKED

Ga., Valdosta—July 20, by W. H. Gainey, city engr., steel tower, supply tank, 300,000 gal. capacity, other machinery needed for water plant improvements.

Ia., Oakland — July 24, by Bd. School Bd., Washington Twp., 6 water wells.

Mass., Braintree—Town taking bids 1 story, brick pumping station, $15,000-$20,000. F. A. Barber, Tremont Bldg., Boston, engr.

Mass., Rockport—July 24, by Special Com. on Water Supply, at office Bd. Selectmen, stand-pipe, Metcalf & Eddy, 1300 Statler Bldg., Boston, engrs.; adv. E. N.-R. July 16. Noted July 9.

Mass., Waltham—See "Contracts Awarded."

Minn., Duluth — July 20, by E. W. Kelley, city engr., retention basin, for Water & Light Dpt. $250,000.

N. J., Holmdell—July 17, by Dpt. Institutions & Agencies, State Office Bldg., Trenton, water treatment plant, incl. aeration, filtration. $15,000. Div. Architecture & Constr., State Office Bldg., Trenton, archts.

N. J., Paterson — Aug. 3, at office Passaic Valley Water Comm., 156 Ellison St., 3 fixed blade turbine, 600 kw. generator units; 1 automatically adjustable-blade turbine 600 kw. generator units, Contr. 11, F. A. Barbour & W. Fuller, engrs.; adv. E. N.-R. July 16.

N. Y., Albany—July 24, at office Dpt. Conservation, State Office Bldg., dam, intake, watermains, appurteanances on lands State Forest Preserve in Great Lot 2 Rogers Road Patent for Schroon Lake Water Dist., town of Schroon, Essex Co. Solomon & Keis, 257 Bway., Troy, consult. engr.; adv. E. N.-R. July 16.

N. Y., Binghamton—Aug. 5, at office Dpt. Mental Hygiene, State Office Bldg., Albany, repairing filtration plant at Binghamton State Hospital. F. W. Parsons, comr.; adv. E. N.-R. July 16.

N. Y., Brooklyn — July 14, by J. J. Dietz, comr. Water Supply, Gas & Electricity, Municipal Bldg., New York, mains in Glenwood Rd., Avenues J and H, Sheridan, Bergen, Catherine, Cooper, Pacific, President, Willoughby, 5th, East 42nd, East 46th, East 88th, East 96th and South 8th Sts.

N. Y., LeRoy—July 22, by Bd. Water & Light Comrs., earth dam, with rein.-con. corewall, extending existing filter plant, furnishing pipes, J. P. Wells, 80 East Ave., Rochester, consult. engr.; adv. E. N.-R. July 16. Noted July 9 Daily.

N. Y., New York—July 21, by J. J. Dietz, comr. Water Supply, Gas & Electricity, Municipal Bldg., mains in Throggs Neck Blvd., Bolton and Tier Sts., Hobart, Navy, Paulding, Pearsall, Olmstead, and St. Raymond Aves.

N. Y., St. George—July 21, by J. J. Dietz, comr. Water Supply, Gas & Electricity, Municipal Bldg., New York, mains in Daniel Low and Slosson Terraces, Brownell, Fillmore, Harrison, Meadow, Patten, Pearson, Tompkins, and Quinn Sts., Amboy, Bloomingdale and Princess Bay Rds., Burke, Bush, Central, Decker, Hopping, Lake, Lineoleum, Lockman, Melvin, Van Name and Wild Aves.

O., Zanesville—July 27, by Bd. Control, standpipe, auxiliary watermains to same, on Putnam Hill. $40,000.

Pa., Lancaster—July 29, by City, 5,000 lin.ft. 10- to 12-in. water mains and several miles of 8- to 96-in. sewers. $500,000. J. N. Chester Engineers, Clark Bldg., Pittsburgh, engrs. Noted May 28.

Tenn., Memphis—Aug. 12, by Bd. Water Comrs., Sheahan Pumping Station, J. Sheahan, genl. supt.; adv. E. N.-R. July 16.

Tex., Corpus Christi — Aug. 10, by City, at office T. Koester, secy., rehabilating La Fruta Dam on Lake Lovenskiold, near La Fruta, incl. 42,000 cu.yd. excav., 18,000 cu.yd. concrete, 285 tons reinforcing steel, 1,600 tons steel sheet piles, five 20 x 35 ft. Taintor gates, two 6 x 6 ft. sluice gates, electrically operated, one 7 x 7 ft. butterfly valve and two 48 in. gate valves. $475,000; R. J. Cummins & H. E. Elrod, 1105 Nixon Bldg., Corpus Christi, or 727 Bankers Mortgage Bldg., Houston, consult. engrs.; adv. E. N.-R. July 16. Noted July 9.

Wash., Tacoma—City Council bids about Aug. 25, replacements on Green River gravity line, constructing pump station at Hood Street Reservoir, extending water-main connecting with Hood Street Reservoir, improving water works. $310,000. C. E. Putnam, city engr.

CONTRACTS AWARDED

Ark., Magnolia—Bd. Tarustees Agricultural & Mechanical College, 435 ft. 16 in. gravel well, 150 g.p.m. centrifugal deep well pump and 20 hp. motor, one 25,000 gal. tank on 75 ft. tower, to Layne-Arkansas Co., Stuttgart. Noted June 19.

Calif., San Bernardino—For 8,400 ft. 20 in. centrifugally cast B and S c.i. pipe, to Amer. Cast Iron Pipe Co., 412 West 6th St., Los Angeles, $30,912; fittings for same, to Reliable Iron Fdry. Co., 1611 Fishburn St., Los Angeles, $984.

Ind., Fort Wayne—City, pile driving and excavation for central filtration plant Three Rivers Park Waterworks, to J. Dehner, Inc., Fort Wayne, $90,000.

Mass., Boston—Dpt. P. Wks., J. A. Rourke, comrs., high pressure water piping, Washington St., to C. & R. Constr. Co., 75 Bradeen St., Roslindale, $96,588. Noted June 25.

Mass., Brookline—Water Bd., altering 1 story, 90 x 110 ft., brick, municipal pumping station, rear 260 Gardner St., to D. L. MacFarlane, 203 Jefferson St., Dedham. Est. $15,000. Noted Apr. 29 Daily.

Mass., Walpole—Town, erecting steel water standpipe, to Chicago Bridge & Iron Wks., 250 Stuart St., Boston, $15,800. Est. $20,000. Noted Apr. 2.

Mass., Waltham — City, high pressure water plant, Cedarwood St., day labor, $50,000.

Mass., Woburn — At Office H. V. Macksey, supt. P. Wks., ground water supply system addition, to P. D. Bowler, 37 West Van Buren St., Chicago, Ill., $55,000. Noted May 21.

Mich., St. Joseph—City, I. Wagner, clk., furnishing, installing pumps, motors and reserve engine for pumping plant and filtration system. Westinghouse motors and Sterling gasoline engine for reserve, to Amer. Well Wks., Aurora, Ill., $11,760; valves for system, to James B. Clow & Sons, South Franklin St., Chicago, Ill., $5,277. Noted May 7.

See proposal advertising on page 77

Constr. News page 19

LEADITE

Trade Mark Registered U.S.Pat. Office

3,595.57 Miles of Bell and Spigot Water Mains

laid by these 24 Users alone

—with LEADITE JOINTS

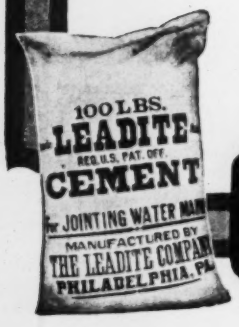
User's Name	*Miles of pipe laid*	*Sizes of pipe, Diameter*
Bridgeport Hydraulic Co.	50.00	4″ to 48″
Buffalo, N. Y.	93.08	4″ to 48″
Charleston, S. C.	37.01	4″ to 24″
Dayton, Ohio.	128.25	4″ to 84″
Detroit, Mich.	500.00*	Various
Flint, Mich.	237.41	4″ to 30″
Ft. Worth, Texas.	229.86	4″ to 60″
Hartford, Conn.	53.00	6″ to 16″
Indianapolis, Ind.	171.74	6″ to 24″
Louisville, Ky.	225.20	4″ to 48″
Lynchburg, Va.	19.33	6″ to 36″
M. & J. B. McHugh.	419.00	Various
New Bedford, Mass.	36.00	2″ to 48″
Oklahoma City, Okla.	94.50	6″ to 30″
Penna. Water Co.	130.00	4″ to 42″
Phila. Suburban Water Co.	288.62	Up to 24″
Richmond, Va.	15.23	4″ to 20″
St. Louis, Mo.	120.74	3″ to 36″
St. Louis County Water Co.	240.00*	4″ to 48″
South Bend, Ind.	86.00	Various
Tulsa, Okla.	74.33	4″ to 36″
Washington Sub. Sanitary Dist.	180.00	Up to 24″
Wilson-Hewitt Co.	116.91	6″ to 24″
Worcester, Mass.	49.36	4″ to 42″
	Total 3,595.57	2″ to 84″

*(at least)

—or an "Average" of 149.82 Miles per user

The pioneer self-caulking material for c. i. pipe.
Tested and used for over 30 years.
Saves at least 75%.

THE LEADITE COMPANY
Land Title Building . . Philadelphia, Pa.



No Caulking

Waterworks (Continued)

Minn., Morris—For 1 m.g. steel reservoir, to Pittsburgh-Des Moines Steel Co., Tuttle and Southwest 10th Sts., Des Moines, Ia., $21,158. Noted June 4.

Mo., Memphis—H. Wagner, city clk., earth dam, spillway, riprap, 6,500 ft. 6 in. c.i. flow line, to C. J. Tiernan Co., Macon, $9,998. Noted June 25.

Neb., Lincoln—Constructing Wells 1 and 2, concrete cased, to Kelley Well Co., Grand Island, $3,420 and $2,487 respectively; Wells 1 and 2, armco cased, to Layne & Bowler Co., c/o Layne-Western Co., Mutual Bldg., Kansas City, Mo., $2,490 and $2,000 respectively; 44 mi. electric transmission line, to Henngson Eng. Co., 326 Union State Bank Bldg., Omaha, $5,165; 1 story, 72 x 115 ft., brick, concrete garage, to W. J. Assenmacher Co., Lincoln, $16,459. Grand total $32,021. Est. $19,500. Noted July 2.

N. J., Garfield—Bd. City Comrs., City Hall, deep well pump at East Paterson City Waterworks, to Layne New York Co., Inc., 30 Church St., New York, $5,799.

N. J., Little Falls — Passaic Valley Water Comn., 156 Ellison St., Paterson, dismantling, removing 2 Holly and 4 Reidler pumping units, 4 Francis water turbines and penstocks, 2 steam turbines centrifugal pumping units, to Citron-Byer Co., Muirheid Ave., Trenton.

N. Y., Albany—Bd. Water Supply, completing connections for water distribution system from conduit running into city from Alcove Dam, to M. F. Dollard, Jr., 59 Van Woert St., $35,000.

N. Y., Brooklyn—J. J. Dietz, comr. Water Supply, Gas & Electricity, Municipal Bldg., New York, mains in Pennsylvania Ave., to Ozone Park Water Pipe Co., $8,880; in Linden Blvd., to Beaver Eng. Co., 51 Chambers St., New York, $39,700. Noted June 25.

N. Y., Long Island City—J. J. Dietz, comr. Water Supply, Gas & Electricity, Municipal Bldg., New York, mains in Calums Ave., to S. Gallucci, 33 Railroad Ave., Corona, $8,338. Noted June 25.

O., Greenwich—Village Clerk, erecting 10 x 16 ft. pump house, installing 2 centrifugal pumps with valves, laying 8,400 ft. 8 in. c.i. pipe, to T. C. Brooks & Sons Co., Jackson, Mich., $14,700. Noted June 11.

Wash., Seattle—Mountain Lakes Water Co., 10107 Woodland Park, Seattle, 24 mi. 24- to 42-in. pipe line, diversion dam storage reservoir, to Ulen Eng. Corp., Lebanon, Ind., and 120 Bway., New York, $2,000,000. Noted June 4.

Wis., Milwaukee—Mains in North 9th St., to Mierswa Constr. Co., 2028 West Cherry St., $12,339; in North 34th St., to A. W. Glowe, Inc., 20 State St., Wauwatosa, $1,154.

Ont., Hamilton—City Clerk, furnishing, installing mixing equipment for Beach filtration plant, to Dorr Co., Inc., 330 Bay St., Toronto, $18,697. Noted Jan. 8.

SEWERS

PROPOSED WORK

Calif., Los Angeles—Bd. P. Wks., 8- to 27-in. vitr. D. and W. S. pipe, manholes, junction chambers in Anaheim and Badger Ave. Sewer Dist. $97,500.

Calif., Whittier—Sewage disposal plant at Sewer Farm. $25,000. Black & Veatch, 810 Boylston St., Pasadena, engrs.

Ill., Harrisburg—Preliminary plans sewers, disposal plant. Russell & Axon, 6200 Easton Ave., St. Louis, Mo. engrs.

Ill., Highland—Preliminary plans improving sewerage system. Caldwell Eng. Co., Jackson, Ill., engrs.

Kan., Great Bend—City storm sewer. To exceed $25,000. C. Haskins, 822 Finance Bldg., Kansas City, Mo., engrs.

N. J., Ocean City — Bd. City Comrs., City Hall, sanitary sewers in 17th St. and Bayou Sect. **Maturity probably soon.** W. H. Collisson, Jr., city engr.

N. Y., Long Island City—G. U. Harvey, pres. Queens Boro, Queens Subway Bldg., rejected bids June 29, sewers in 84th Dr. Noted June 25.

O., Wooster — Wayne Co. draining 7 mi. Chippewa Valley, in Milton and Chappewa Twps. $34,000.

Okla., Oklahoma City—Preliminary plans sanitary sewers in Pennsylvania, Drexel and 33rd Sts. $35,000. L. M. Bush, city engr.

R. I., Providence—Sewerage works in Leo and Alger Aves., Marietta, Wilkie and Glover Sts. $25,000.

Va., Petersburg—P. Morton, city mgr., 3 mi. sanitary sewers, reconstructing police and fire alarm system and other municipal improvements.

BIDS ASKED

Ill., Chicago—July 30 (extended date), by J. J. Sullivan, clk., Chicago Sanitary Dist., 910 South Michigan Ave., constructing Calumet Sewage Treatment Works Extension, Div. C; adv. E. N.-R. July 16. Noted June 25.

Ky., Louisville—July 23, by Comrs. Sewerage, 400 Marion E. Taylor Bldg., F. D. Walsh, acting chn., constructing Beargrass Intercepter, Sect. H, Deer Park Sewer Connection and Jefferson Co. Cantonment Sewer Relocation, Contr. 56. W. M. Caye, technical engr.; adv. E. N.-R. July 16.

Mass., Boston — July 21, by Dpt. P. Wks., J. A. Rourke, comr., sewerage works in Dorchester; July 24 in Brighton. $25,000.

N. Y., Albany — Aug. 5, at office Dpt. Mental Hygiene, State Office Bldg., sewage disposal system at Hudson River State Hospital, Poughkeepsie. F. W. Parsons, comr.; adv. E. N.-R. July 16.

N. Y., Brooklyn—July 22, by H. Hesterberg, pres. Brooklyn Boro, Boro Hall, sewers in 101st and East 46th Sts.

N. Y., New York — July 21, by Bd. Transportation, J. H. Delaney, chn., 250 Hudson St., sewer connection in East 174th St., Route 106, Sect. 3, Agreement "KV."

Pa., Phila.—July 22, by Dpt. P. Wks., A. Murdoch, dir., City Hall Annex, Bureau Eng. & Surveys, Schedule A, filling old sewer in Willow St. and constructing new sewer in right-of-way through property of Reading Co. outside lines of Willow St. between Delaware River and New Market St.; Schedule B, main effluent conduit in proposed Island Ave. and city property from Delaware River to Chester branch of the P. B. & W. R.R.; Schedule C, intercepting chambers and appurtenant work in Margaret St. from Frankford Creek to Bermuda St. and also in private property from point northwest of Frankford Creek and Northeast of Margaret St. $300,000-$400,000.

CONTRACTS AWARDED

Ark., Forest City—City, 20,000 ft. 6- to 10-in. vitr. clay sewers, manholes, to McEachin & McEachin, 710 Southern Bldg., Little Rock, $19,968. Noted July 2.

Calif., Santa Monica—Vitr. sewer in Colorado St., to M. Smunnovich, 3305 West 66th St., Los Angeles, $27,350. Noted June 19.

Conn., Greenwich—Town, P. L. Minor, supt. P. Hys., concrete drain extension in Water St., to W. Johnson, Sound View Ave., $33,900. Est. $35,000.

Conn., Hamden (br. New Haven) — Town, sanitary sewers in Spring Glen, to A. DiMarco, 171 East Post Rd., White Plains, N. Y., $63,557. Noted June 18.

Kan., Dodge City—City, E. C. Hathaway, clk., sanitary sewers, sewage pumping station, to C. L. Burt, Hutchinson, $17,861. Noted June 25.

Md., Baltimore—Bd. Awards, sanitary sewers and storm drains, Sanitary Contr. 283, to Wm. H. Thompson Contg. Co., Relay, $35,772. Noted June 25 Daily.

Mass., Norfolk—Dpt. P. Health, Pondville Hospital, filter beds, sludge beds, disposal plant addition, incl. settling and dosing tanks, to Munroe & Westcott, Inc., North Attleboro, $36,995. Est. $75,000. Noted July 2 Daily.

Neb., Nebraska City—City, North Side Trunk Sewers, 1.25 mi. 10- to 18-in. vitr. clay pipe, to William Beltz Constr. Co., Council Bluffs, Ia., $10,226. Noted June 18.

N. Y., Long Island City—G. U. Harvey, pres. Queens Boro, Queens Subway Bldg., to A. Capasso, 4121 Gunther Ave., New York, sewers in Braddock Ave., $4,511; to Di Salvo Contg. Co., 2441 Butler St., East Elmhurst, 89th Ave. $32,124, 161st St. $9,631; to Franzese & Catapano, 120th Rd. $2,965, 194th St. $6,183, Sutter Ave. $1,478; to Mannino & Pattari, 283 86th St., Brooklyn, 91st Ave. $82,275; to P. Tomasetti & Co., 1074 60th St., Brooklyn, 114th Ave. $156,616; to A. Mato, 120th Ave., $5,130. Grand total $300,913. Noted June 25.

N. Y., New York—S. Levy, pres. Manhattan Boro, Municipal Bldg., sewers in 59th St., to Cleverock, Inc., 20 East 45th St., $125,967; borings in 12th Ave., to Battle Bros., $7,614. Noted June 11.

N. Y., St. George—J. A. Lynch, pres. Richmond Boro, Boro Hall, sewers in Hillside Terrace, to G. Orrico, 500 Britton Ave., West New Brighton, $1,558; regulating Midland Ave., to J. J. O'Rourke, 239 Gordon St., Stapleton, $10,737. Noted June 25.

O., Hubbard—Village Council, sewage disposal plant, incl. 17 x 22 ft., brick, concrete pump house, centrifugal pump, 32 x 60 ft., concrete Imhoff settling tank, 60 x 120 ft. settling or sludge bed, to Burnip Constr. Co., 568 East Broad St., Columbus, $24,612.

Pa., Phila—Dpt. P. Wks., Bureau Eng. & Surveys, City Hall Annex, A. Murdock, dir., Schedule B, main gravity intercepting sewer in Mingo Ave. from Penrose Ave. to Mingo Creek, to Peter and A. J. Ellis, 4th and Wyoming Sts., $121,546. Noted June 4.

Wash., Seattle—Bd. P. Wks., sewers in 15th Ave. S.W., to J. Coluccio, 1642 Lane St., $77,149.

WASTE DISPOSAL

PROPOSED WORK

N. Y., New York—Dpt. Sanitation, Municipal Bldg., preliminary plans incinerator, Lafayette Ave. To exceed $500,000.

BRIDGES

PROPOSED WORK

Calif., Santa Cruz — Santa Cruz Co., rein.-con. or steel bridge over San Lorenzo River opposite Felton Acres. $40,000 funds to be provided in 1931-1932 budget. L. Bowman, Santa Cruz, co. surv.

Ind., Evansville—Bd. Comrs. Vanderburgh Co. steel bridge over Pigeon Creek, at Franklin St. $120,000. Saunders Civil Engineer & Surveyors, 5 Koenig Bldg., engrs.

Kan., Kansas City—City Council, Kansas City Pub. Serv. Co., Kansas City Terminal, Chicago, Rock Island & Pacific Ry. Co., Kansas City viaducts, additions, repairs, $25,000. Howard, Ash, Needles & Tammen, 1012 Baltimore St., Kansas City, Mo., engrs.

Mass., Ashland—Town, E. Morey, chn. Bd. Selectmen, concrete, steel bridge, Homer Ave. $25,000.

Mass., Quincy — New York, New Haven & Hartford R.R. Co., E. E. Ovratt, New Haven, Conn., ch. engr., rebuilding steel, rein.-con. bridge for railroad at School St. to exceed $25,000; also constructing rein.-con. underpass for pedestrian's at State St., Quincy R.R. Station, $25,000.

N. J., Avalon — Bd. Freeholders Cape May Co., Court House, Cape May Court House, preliminary plans steel, timber bridge over Ingrams Thoroughfare, $25,000. R. Sharp, Cape May Court House, co. engr.

N. J., Browns Mills—Twp. Com. Cinnaminson Twp., creosoted timber bridge over White Canal, $25,000. **Maturity probably soon.** H. R. Smith, Mount Holly, engr.

N. J., New Brunswick — Bd. Freeholders Middlesex Co., Court House, will not build rein.-con. bridge over Farrington Lake and Oakleys Brook from Fresh Pond to Georges Rd. $25,000. Project abandoned. Noted June 25.

N. Y., St. George—Dpt. Plant & Structures, Municipal Bldg., New York, viaduct in connection with municipal ferry terminal project, $450,000. **Maturity late fall or winter.** Noted May 1, under "Public."

Okla., Norman—State Hy. Dpt., Oklahoma City, preliminary plans 7 span 118 ft. rein.-con. bridge, Cleveland Co., near here. $25,000. A. R. Losh, hy. engr.

Tex., Channing—Hartley Co. 600 ft. rein.-con. bridge over Punta De Agua Creek, on Romero-Channing Rd. $100,000. Address County Eng. Dpt., Channing.

Tex., Schertz—Bexar Co. (San Antonio and Guadalupe Co. (Seguin), 280 ft. vehicular concrete, steel, bridge, 24 ft. over Cibolo Creek, $30,000. E. P. Arneson, Gunter Bldg., San Antonio, engr. Noted June 4.

Ont., Galt—Erecting 2 span, rein.-con. bridge, Main St. $65,000. Ratepayers will vote July 21 on bylaw for same. Deverall & Creelock, 702 Kent Bldg., 156 Yonge St., Toronto, engrs. Noted June 11.

Ont., Owen Sound—Grey Co., replacing Powers Bridge, $35,000. F. H. Rutherford, County Bldgs., co. clk.

BIDS ASKED

Calif., Los Angeles—Bd. Supervs. Los Angeles Co. bids about Sept. 3, 12 span 480 ft. steel girder bridge over Los Angeles River, and 13 span 520 ft. steel girder type bridge over Rio Hondo, both on Firestone Blvd., each exceeds $60,000. W. D. Armstrong, 1202 Hall of Records, co. engr.

Calif., San Leandro—Aug. 5, by City Council, steel, concrete bridge over San Leandro Creek, Park St. $35,000. Noted Apr. 2.

Maryland — July 21, by State Roads Dpt., G. C. Uhl, chn., Baltimore, repairing by bridge over South River, Contr. AA-125-711, Anne Arundel Co. L. H. Steuart, secy.; adv. E. N.-R. July 16.

Minnesota—July 21, by State Hy. Dpt., St. Paul, Bridge 5049, State Project 9-45-3—Bridge 5102, over Minnesota River, S. P. 52-31, near Montevideo—Bridge 5022, S. P. 53-21—Bridge 5081, near Inver Grove.

Mo., St. Louis—Aug. 4, by Bd. P. Serv., City Hall, 150 ft. rein.-con. bridge, 56 ft. roadway, two 12 ft. walks, over Maline Creek on Riverview Dr. $98,560. L. R. Bowen, city engr.

Nev., Reno—July 25, by E. H. Beemer, clk., Washoe Co., Class A hospital, $150,000. F. J. De Longchamps, Gazette Bldg., archt.

New Jersey—July 27, by State Hy. Comm., Trenton, 2 bridges on Route 2, Sect. 6, Essex and Passaic Sts., Maywood and Rochelle Park Boros, Bergen Co. A. L. Grover, ch. clk.

New Jersey—Aug. 3, by State Hy. Comm., Trenton, steel superstructure with ramp connections, constructing founds., retaining walls, embankment, pavements, other incidental work Route 25, Connecting Link, Sects. 8 and 8-A, Contr. 51, Essex Co. A. L. Grover, ch. clk.; adv. E. N.-R. July 16.

New York—Aug. 11 (extended date), by A. O. Smith, hy. supt. at office Bd. Supervs. Suffolk Co., Riverhead, constructing substructures Shelter Island-Sag Harbor Bridge, near Sag Harbor and Shelter Island-Greenport Bridge, near Greenport. Robinson & Steinman, 117 Liberty St., New York, consult. engrs. Noted June 18.

N. Y., Comstock—July 21, at office Dpt. Correction, State Office Bldg., Albany, bridge over Barge Canal, at Great Meadow Prison, $72,369; adv. E. N.-R. July 16.

Ohio—July 28, by O. W. Merrell, dir. hys., Columbus, concrete beam bridge, Sect. "B" Ashland-Norwalk Rd., Ashland Co., $2,125—2 concrete beam bridges, Sect. "D" Haynesville-Nashville Rd., Ashland Co., $6,972—28 28 ft. concrete beam bridge, 24 ft. roadway, 33.94

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Bridges (Continued)

ft. span, concrete slab bridge, 30 ft. roadway and 30 ft. span concrete beam bridge, 24 ft. roadway, approaches. Sect. "B" Springfield-Mechanicsburg Northern Rd., Champaign Co., $24,374—59.16 ft. span steel girder bridge, 30 ft. roadway, two 3 ft. sidewalks, Sect. "E" Lisbon-East Palestine Rd., Columbiana Co., $17,387—36 ft. span, concrete beam bridge, 34 ft. roadway, Sect. "A" Bucyrus-Tiffin Rd., Crawford Co., $11,621—40 ft. span concrete beam bridge, 24 ft. roadway, Sect. "R" Sidney-Versailles Rd., Darke Co., $8,455—40 ft. span, steel I-beam bridge, 30 ft. roadway, with timber flooring, Sect. "L-1" Chagrin Falls-Grenville Rd., Geauga Co., $9,258—40 ft. span concrete beam bridge, 41 ft. roadway, two 3 ft. sidewalks, approaches, Sect. "T" Cincinnati-Dayton Rd., Hamilton Co., $20,126—two 25 ft. span rein.-con. slab bridge, 28 ft. roadway, two 4½ ft. sidewalks, Sect. "Jackson" Chillicothe-Jackson Rd., Jackson Co., $9,692—26.58 ft. span concrete beam bridge, 44 ft. roadway, Sect. "T" Toledo-Wauseon Rd., Lucas Co., $10,172—three 45.38 ft. span rein.-con. beam bridge, two 4½ ft. sidewalks, 32 ft. roadway, Sect. "A" National Rd., Madison Co., $28,083—concrete slab bridge, two 25 ft. sidewalks, 34 ft. roadway, Sect. "K-1" Cleveland-Hinckley-Medina Rd., Medina Co., $9,699—concrete beam bridge, culverts, Sect. "A" Lancaster-Chillicothe Rd., Pickaway Co., $7,226—80 ft. center span, two 60 ft. end span steel I-beam bridge, 24 ft. roadway, Sect. "G" Delaware-London Rd., Union Co., $28,569—three 60 ft. span concrete filled spandrel arch bridge, 34 ft. roadway, two 3 ft. sidewalks, approaches, Sect. "H" Bucyrus-Upper Sandusky Rd., Wyandot Co. ,$93,676.

Ore., Portland—City Comrs., City Hall, bids about Aug. 1, 431 ft. concrete, steel viaduct over railroad tracks in Holiday Park, Sullivans Gulch, $130,000. P. Laurgard, city engr.

CONTRACTS AWARDED

California—C. H. Purcell, engr., State Hy. Comn., Sacramento, widening existing multiple span arch bridge over Santa Ana River, by constructing alongside existing bridge multiple span rein.-con. arch bridge, incl. two 95 ft., two 102 ft. and one 106 ft. spans on concrete piers, abutments, pile founds., Riverside Co., to Byerts & Dunn, 7908 Santa Monica Blvd., Los Angeles, $105,865; constructing rein.-con. bridge to have 127 ft. open spandrel, two 44 ft. and two 36 ft. girder spans over Granite Creek, 14 mi. south of Monterey, Monterey Co., to George J. Ulrich Constr. Co., Modesto, $33,705.

Calif., Los Angeles—Bd. Comrs. Los Angeles Co., three 60 ft. span, Howe-Truss type, redwood bridge over San Gabriel River, Carson St., to Giebisch & Hoak, 12 Virgil Walk, Long Beach, $18,000. Noted June 19.

Iowa—State Hy. Dpt., Ames, bridge in Buchanan Co., to W. Denny, West Liberty, $7,685—Cherokee Co., to Wickham Bridge & Pipe Co., Council Bluffs, $47,225—Crawford Co., to Duvell & McKinney, Logan, $4,334—Dallas and Polk Counties, to Snyder & Johnson, Humboldt, $41,200 and $17,769 respectively — Keokuk Co., to Kelley & Overman, Villisca, $12,247—Group 2, Lee Co., to C. Jordon, Centerville, $25,897—Group 1, Lee Co., to Rock Constr. Co., Washington, $17,602—Woodbury Co. and Group 3 Woodbury Co. to Christensen Bros., Tyler, Minn., $7,190 and $7,190 respectively—Mahaska Co., to J. W. Schroyer, Baxter, $849—Harrison Co., to H. O. Graham, Cedar Rapids, $1,048—Winnebago Co., to C. Jensen, Thompson, $3,300—Groups 1 and 2, Woodbury Co., to Lundgren Reis Co., 125 College St., Des Moines, $27,766. Grand total $221,302.

Iowa—State Hy. Dpt., Ames, bridges in Bremer Co., to A. Willis, Shell Rock, $817—Dallas Co., to C. W. Boltz, Des Moines, $4,345—2 briges, Delaware Co., to Schaaf & Jakobsen, Lake Park, $3,260—Delaware Co., to A. Olsen Constr. Co., Waterloo, $12,046—Fremont Co., to W. E. Carlson, Essex, $1,134—Clinton and Jackson Counties and Jackson Co. to J. B. Elliott, Independence, $39,844 and $49,850 respectively—Johnson Co., to G. J. Chadek, Iowa City, $2,471—Linn Co., to A. Melberg, Cedar Rapids, $14,000—Linn Co., to W. Denny, West Liberty, $1,148—Madison Co., to C. W. Akin, Atlantic, $8,354—Marion Co., to E. A. Kramme Co., Des Moines, Ia., $5,991—Marion Co., to Forgie & Groth, Sioux City, $30,700—Marion Co., to F. Stoops, Ames, $11,588. Grand total $185,548.

Kentucky and Indiana—Louisville & Nashville R.R. Co., W. H. Courtenay, ch. engr., 10th St. and Bway., Louisville, Ky., substructure 69 span 8,000 ft. steel bridge over Ohio River, at Henderson, to Missouri Valley Bridge & Iron Co., Leavenworth, Kan., superstructure, to Amer. Bridge Co., Frick Bldg., Pittsburgh, Pa. Est. $1,000,000.

Louisiana—State Hy. Comn., Baton Rouge, east end approach to Shreveport Bridge, to Flenniken Constr. Co., Shreveport, $90,513—constructing Cane River Bridge, to Royce Kershaw, Inc., Mobile, Ala., $51,386—Monroe Bridge over Ouachita River, to Stevens Bros., 612 Endicott Bldg., St. Paul, Minn., $485,813—Shreveport Bridge over Red River, to List & Weatherly Constr. Co., 413 Railway Exch. Bldg., Kansas City, Mo., $718,633—bridge over Red River at Alexandria, to Cole & Moore, Paducah, Ky., $417,231. Grand total $1,763,576.

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Mass., Boston—Dpt. P. Wks., steel, concrete foot bridge over New York, New Haven & Hartford R.R. and Dorchester Rapid Transit, at Butler St., Dorchester, to J. A. Singarella, Park Sq. Bldg. Est. $25,000. Noted June 18.

Michigan—H. W. Hagaman, div. engr., 504 Eddy Bldg., Saginaw, FB. 1 of 76-13-10 2 rein.-con. abutments, steel deck girder, Shiawassee Co., Contr. 1 to McClintic-Marshall Corp., 1242 Book Bldg., Detroit, $4,382; Contr. 2, to W. J. Anschutz, Saginaw, $18,123, for State Hy. Dpt., Lansing. Noted June 11.

N. Y., Buffalo—W. G. Hickman, comr. Erie Co., 60 ft. span steel plate girder bridge over Eighteen Mile Creek, on Patchin Rd., to W. C. Meserve, Westbrook Apts., $25,250.

Ohio—O. W. Merrell, dir. hys., Columbus, to V. H. Mertz, St. Johns, 2 concrete slab bridges, Champaign Co., $8,343; concrete slab bridge, Crawford Co., $6,474; concrete beam bridge, Portage Co., $5,704 — to Drumm & Straley, Celina, concrete beam bridge, Crawford Co., $12,569—to H. B. Watters Co., 8 East Long St., Columbus, concrete beam bridge, Franklin Co., $37,990—to Clark Bros. & Co., Maysville, Ky., concrete beam bridge, Highland Co., $22,742—to W. J. Elliott, McConnelsville, concrete slab bridge, Noble Co., $10,953—to W. Yeagle, Clyde, steel I-beam bridge, Wayne Co., $17,900. Grand total $120,675. Noted June 25.

Ohio — O. W. Merrell, dir. hys., Columbus, two 32 ft. span concrete beam bridge over Marsh Run, 24 ft. roadway and 68 ft. span steel bridge, approaches, 24 ft. roadway over West Branch Huron River, Huron Co., to Modern Constr. Co., Fremont, $99,564. Noted June 25.

O., Cleveland—Cuyahoga Co. ,rein.-con. bridge over Columbus Rd. in connection with Lorain-Central Bridge, to Lowensohn Constr. Co., Newman-Stern Bldg., $166,132. Est. $284,658. Noted June 11.

Pa., Pittsburgh—R. G. Woodside, controller Allegheny Co., Court House, constructing substructure and removing existing bridge, Bridge 8, Thompsons Run Rd., to F. Kukurin, Wilmerding, $14,820—gunite protection, McKees Rocks Bridge 2, Ohio River, to Cement Gun Co., Fulton Bldg., $9,720—reinforcing south abutment, Bridge 20, Chartiers Creek, to F. Bryan, 1263 Chartiers Ave., McKees Rocks, $2,817—test bolings at side of Bridge 9, Saw Mill Run at Elwyn Station, Baldwin Twp., to Sprague & Henwood, Chamber of Commerce Bldg., $557. Grand total $27,914. Noted June 4.

Tenn., Danville—Louisville & Nashville R.R. Co., W. H. Courtenay, ch. engr., 10th and Bway., Louisville Ky., founds. and piers for 6 span 1,470 ft. concrete, steel lift bridge over Tennessee River, to Dravo Constr. Co., Neville Island, Pittsburgh, Pa.; superstructure for same, to Virginia Bridge & Iron Co., Roanoke, Va. Est. $400,000.

Wisconsin—State Hy. Comn. and Hy. Coms. Monroe and Juneau Counties, Madison, to E. Blank, Cochrane. McCaul Bridge $2,893; Hughart Bridge $3,679; Mann Bridge $4,306; Euchuck Bridge $3,591; Burmeister Bridge and 2 cattle passes $4,140. Grand total $18,609. Noted June 11.

STREETS AND ROADS

BIDS ASKED

Arizona—July 28, by C. H. Sweetser, dist. engr., Title & Trust Bldg., Phoenix, grading 6.432 mi. Sect. B, Route 10, Pine-Winslow Natl. Forest Hy., Coconino Co.

Arkansas — State Hy. Dpt., Little Rock, rejected bids July 2, grading, bituminous concrete paving 13 mi. Faulker, Co., 30 ft., $250,000; 2 mi. Phillips Co., 26 ft., $60,000. C. S. Christian, hy. engr. Noted June 25.

California—July 22, at office C. H. Purcell, state hy. engr., Sacramento, grading, untreated crushed gravel or stone surfacing 8,000 cu.yd. I-D.N-1-C. Del Norte Co.—grading, bituminous treated crushed gravel or stone surfacing 10.2 mi. I-Hum-1-E,F. Humboldt Co.—bituminous treated crushed gravel or stone widening 6.6 mi. 111-But-3-D, Butte Co.—gravel base surfacing 12.3 mi. 111-Lak, Col-15-C,D, Lake and Colusa Counties—crusher run borders on 9.6 mi. V-S.B-2-3.F and G, Santa Barbara Co.

California—July 29, by State Hy. Comn., Sacramento, grading, concrete paving 1.1 mi. hy. at Jacumba, San Diego Co.; bituminous crushed rock surfacing road between 14 mile Stone and Fresh Pond Rd., El Dorado Co. C. H. Purcell, Public Wks. Bldg., Sacramento, engr.

Calif., Los Angeles—Bd. Supervs. Los Angeles Co. bids about Sept. 3, grading, widening, curbing, walks, guttering, rein.-con. box culverts, sewers, 403,180 sq.ft. fire hydrants, water-mains, reconstructing lighting system, concrete, rein.-con., 5 in. oiled macadam, 3 in. oiled macadam and 1½ in. oiled macadam paving, 9-7-9 in. concrete paving 359,346 sq.ft. and 8 in. concrete paving 117,499 sq.ft. Foothill Blvd. between Santa Anita Ave., and Sierra Madre Villa Ave., et al., $222,556; grading, incl. shaping, curbing, drainage structures, 9-7-9 in. concrete paving 370,076 sq.ft., 8 in. concrete paving 45,521 sq.ft. and 4 in. oil macadam paving 403,180 sq.ft. Covina Blvd. from Pacific Ave. to Hollenbeck St. at West City boundary of Covina, to exceed $25,000. G. W. Jones, Hall of Records Bldg., engr.

Calif., Sierra Madre—July 22, by City Council, 3 in. asphaltic concrete paving 125,000 sq.ft. also retaining walls, storm drains on Woodland Dr. et al. Noted June 11.

Conn., Meriden—Taking bids street improvements. $250,000 bonds voted for same. C. P. Prann, City Hall, engr.

Idaho—July 23, at office A. Harbour, comr. P. Wks., Boise, grading, crushed rock paving 6,600 cu.yd. Payette Hy., Valley Co.; 5,100 cu.yd. Lost River Hy., Bingham Co.

Ill., Springfield—July 17, by Sangamon Co. concrete paving 1.0208 mi. Sect. 11-15d, 18 ft. G. H. Baker, engr. co. roads.

Ind., Bloomfield—Aug. 4, by H. Rollison, aud. Greene Co., graveling John Driscoll Rd.—stone paving D. A. Whaley Rd. — macadam paving M. L. Hamilton, Will Gibson and J. W. Arthur Rds. $47,063.

Ind., Crown Point—Aug. 4, by Bd. Comrs. Lake Co., concrete paving Charles N. Scott Rd. $150,000. W. E. Whitaker, Crown Point, aud.

Ind., Winchester—July 27, by Randolph Co., O. W. Brown, aud., bituminous paving 11,315 ft. Alonza Harmeson Rd., $23,625 — 7,911 ft. Mahlon O. Evans Rd., $11,555 — graveling 13,887 ft. E. T. Foutz, Rd., $10,500.

Iowa — July 21, by State Hy. Dpt., Ames, bituminous surfacing 1,450 lin.ft. Boone Co.—3,700 lin.ft. Marshall Co.—1,600 ft. Hardin and Franklin Counties—1,500 ft. Hardin Co.—1,320 ft. O'Brien Co.—bridges, culverts in Adams, Jackson, Louisa, Page and Fremont Counties.

Ia., Indianola—July 27, by Warren Co., grading 7.41 mi. trunk and local roads.

Ia., Lansing—July 20, by F. L. May, city clk., curbing, guttering concrete paving 9,345 sq.yd. M. Tschirgi & Sons, Cedar Rapids, engr.

Ia., Primghar — July 23, at office Auditor O'Brien Co., graveling 15 mi. and maintenance graveling 10 mi. secondary road.

Kentucky — Aug. 12, by State Hy. Comn., Frankfort, grading 8.4 mi. Columbia-Creelsboro-Albany Rd., Adair Co.—5.1 mi. Liberty-Lebanon Rd., Casey Co.—3.4 mi. Dixon-Henderson Rd., Webster Co. — 3.7 mi. Shelby-LaGrange Rd., Shelby Co. — surfacing 9.9 mi. Calhoun-Beech Grove Rd. — 5.7 mi. Beech-Grove-Eastwoods Ferry Rd., both McLean Co.—12.4 mi. Sturgis-Shawneetown Rd.—drainage structures on Morganfield-Uniontown Rd., both Union Co.—bridging, grading, drainage approaches Carrollton-Warsaw Rd., Carroll Co.

Maryland—July 21, by State Roads Comn., G. C. Uhl, chn., Baltimore, gravel surfacing 0.57 mi. Contr. AA-122-74, Anne Arundel Co.—4.42 mi. Contr. C-44-84, Calvert Co. — sheet asphalt paving 0.41 mi. and concrete shoulders and sheet asphalt paving and bridge extension 0.33 mi. Contr. BC-107-72, Baltimore City—concrete paving 3.2 mi. Contr. C1-81-54, Carroll Co.—400 lin.ft. Contr. Ho-99-38, Howard Co. L. H. Steuart, secy.; adv. E. N.-R. July 16.

Md., Easton—July 20, by Mayor and Town Council, concrete curbing, guttering 14,000 lin.ft. E. G. Kostenhuber, Jr., town engr.; adv. E. N.-R. July 16.

Massachusetts — July 21, by Dpt. P. Wks., State House, Boston, bituminous macadam paving 27,162 ft. hy. incl. steel deck girder bridge, Gill and Greenfield. A. W. Dean, Dpt. P. Wks., State House, Boston, engr.

Massachusetts—July 21, by Dpt. P. Wks., State House, Boston, A. W. Dean, engr., bituminous macadam paving 400 ft. hy., incl. rein.-con. beam bridge over Williams River, West Stockbridge—7,895 ft. hy., incl. rein.-con. extension to stone arch, Stockbridge—bituminous macadam paving 4,700 ft. Nantucket—5,103 ft. Hadley.

Mass., Boston — July 20, by Dpt. P. Wks., J. A. Rourke, comr., artificial stone sidewalks in Wards 8, 12, 14 and 18. $25,000.

Mass., Boston—July 20, by Dpt. School Buildings, grading, paving at William Bradford and Quincy St. School's playgrounds. $25,000.

Mass., Boston—July 22, by Dpt. P. Wks., J. A. Rourke, comr., artificial stone sidewalks in Wards 9, 10, 11 and 19. $25,000.

Mass., Boston—July 23, by Dpt. P. Wks., J. A. Rourke, comr., sheet asphalt or bitulithic paving Washington St., Ward 3. $25,000.

Mass., Melrose—See "Contracts Awarded."

Minnesota — Aug. 4, by State Hy. Dpt., Duluth, grading, draining 9.5 mi. U. S. Hy. 2 from Anmicon Falls to Maple, Douglas Co. G. I. Germond, Telegram Bldg., Superior, engr.

Mississippi — July 20, by State Hy. Comn., Jackson, grading, concrete, sheet asphalt, rock asphalt or asphaltic concrete paving Jackson-Meridian Rd., F. A. P. 185-B, Reopened, Lauderdale Co. C. M. Williamson, dir.

Mississippi — July 27, by State Hy. Comn., Jackson, grading, earth shoulders on Lake-Newton Rd., F. A. P. 197-A Reopened, Newton Co. C. M. Williamson, dir.

Streets and Roads (Continued)

Miss., Yazoo City—July 20, by Mayor and City Council, paving. McGowen & Williams, Yazoo City, consult. engrs.

Mo., Clayton — July 22, by St. Louis Co., Court House, grading, graveling 2,200 ft. Keefer Creek Rd.—grading, rein.-con. paving 6,150 ft. Jennings Station Rd.—2,342 ft. Etzel Ave., both 20 ft. wide. R. Jablonsky, co. engr.

Mo., Independence—July 21, by Comrs., Jackson Co., grading, cement paving 272,263 cu.yd. Colborn, Sibley, Grain Valley, Oak Grove East and 63rd St. Rds.; also 7 bridges. L. E. Koehler, hy. engr., Stayton & Veatch, 508 Interstate Bldg., consult. engrs.

Mo., St. Louis—July 28, by Bd. P. Serv., City Hall, 2 ft. macadam shoulders, and concrete paving 6,230 sq.yd. on Hampton Ave. from Scanlon to Marquette Sts., and Hampton Ave. from Scanlon to Columbia Aves., $16,600—19,110 sq.yd. Hampton Ave. from Loran to Pernod Sts., $45,440—granite curbing, asphalt paving High St. from Morgan to O'Fallon Sts., $22,600. W. W. Horner, city engr.

Mo., St. Louis—Aug. 11, by Bd. P. Serv., City Hall, grading 24,100 cu.yd. Fyler Ave., $11,800—6,454 cu.yd. Wilson Ave., $8,160—warrenite bitulithic paving 1,045 sq.yd. Iron St., $5,360 — asphaltic concrete paving 1,660 sq.yd. Dillenberger St., $9,840—asphalt paving 4,105 sq.yd. McCausland Ave., $24,680—1,580 sq.yd. Eveline St., $10,800—12,245 sq.yd. Finney Ave., $73,440—8 in. vibrolithic concrete paving 4,810 sq.yd. Finney Ave., $23,740—4,845 sq.yd. Finney Ave., $22,120 — concrete paving with macadam shoulders 10,240 sq.yd. Hampton Ave., $28,080. W. W. Horner, city engr.

New Jersey—July 27, by State Hy. Comn., Trenton, grading, 10 in. rein.-con. paving 53,215 sq.yd. Route 6, Sects. 2A, 3A and 1D, Abbott Ave. to Christie's Lane, and Grade Avenue Separation, Bergen Co.; grading, 9 in. rein.-con. paving 52,540 sq.yd. Route S-28, Sect. 1, Middlesex Co. A. L. Grover, ch. clk.

N. J., Hawthorne—July 20, by Bd. Boro Comrs., Boro Hall, penetration paving Central and Brookside Aves. $25,000. H. J. Harder, 210 Market St., Paterson, boro engr.

N. J., Hoboken—Bd. City Comrs., City Hall, will not pave streets. $30,000. Project abandoned. Noted June 18.

N. J., Mountain Lakes—July 21, by Mayor and Boro Council, Boro Hall, bituminous penetration paving 3,700 lin.ft. Intervale Road Impvt. F. T. Rubidge, boro engr.

N. J., North Plainfield—Aug. 7, by Mayor and Boro Council, Boro Hall, curbing, guttering, paving 10,000 sq.yd. Greenbrook Rd. O. H. Firstbrook, Babcock Bldg., Plainfield, boro engr.; adv. E. N.-R. July 16.

New York—Aug. 4, by A. W. Brandt, comr. Hys., Albany, improving hys. in Monroe, Wayne, Tompkins and Westchester Counties — reconstructing hys. in Broome, Delaware, Fulton, Monroe, Putnam, Westchester and Saratoga Counties—bridges in Delaware and Schoharie Counties; adv. E. N.-R. July 16.

N. Y., New York—July 23 (extended date), by S. Levy, pres. Manhattan Boro, Municipal Bldg., constructing Div. 2, 12th Ave., Marginal St. and Thomas Park Express Hy. from West 22nd to West 38th Sts. Noted July 7.

N. Y., Rochester—July 22, at office Dpt. Mental Hygiene, State Office Bldg., Albany, concrete roads at Rochester State Hospital, $20,704; adv. E. N.-R. July 16.

N. Y., St. George—July 22, by J. A. Lynch, pres. Richmond Boro, Boro Hall, grading, concrete paving Arthur Kill Rd.—grading, bituminous macadam paving Veltman Ave.—grading Evelyn Pl.

N. Y., White Plains—July 28, by J. Downer, engr. Westchester Co., Court House, curbing, sidewalks, sewers, rein.-con., warrenite bitulithic or sheet asphalt on concrete paving New York Post Rd., South Bway. and Wallace Pl., Co. Rd. 108; adv. E. N.-R. July 16.

North Carolina—July 21, by State Hy. Comn., Raleigh, **(P. means Project)**, hydraulic fill, 1 mi. hy. Route 10, Project 2031, Carteret Co.—asphalt paving 1 mi. Route 10, P.2561, Lenoir Co.—sand asphalt paving 5.5 mi. Route 30, P.3201, Brunswick Co.—grading, structures, topsoiling 4.3 mi. Route 90, P.4013, Chatham Co. —5.6 mi. Route 90, P.4780, Wake Co.—grading, structures 6.7 mi. Route 90, P.7330 Davie Co. —3.5 mi. Route 107, P.9813, Swain Co.—grading, paving 1.5 mi. Route 60, P.5340, Guilford Co.—macadam surfacing 6 mi. Route 28, P.9250, Lincoln and Clay Counties—6 mi. Route 20, P.9694, Madison Co.

Ohio—July 28, by O. W. Merrell, dir. hys., Columbus, grading, drainage structures, brick paving, incl. furnishing, delivering brick 3.72 mi. Secret. "I" Hamilton-Middletown Rd., Butler Co., $83,894—relocating, grading, brick paving, incl. furnishing, delivering brick 0.364 mi. Sect. "I" Toledo Wauseon Rd., Lucas Co., $25,904, concrete $17,464—grading, widening, surfacing 3.021 mi. Sect. "A" Hamilton-Lebanon Rd., Butler Co., concrete $28,884 waterbound macadam $24,638—gravel or stone surfacing 6.985 mi. Sect. "B" Springfield-Mechanicsburg-Northern Rd., Champaign Co., $64,573 — scarifying, reshaping, resurfacing 2.23 mi. Sect. "I" Twinsburg-Elyria Rd., Cuyahoga Co., concrete $27,022, waterbound macadam $22,668—widening, paving 3.015 mi. Sects. "A" and "B" Wauseon-Napoleon Rd., Fulton Co., bituminous macadam $23,944, concrete $25,892—smoothing old brick road, bituminous macadam paving 6.05 mi. Sect. "Wellston" McArthur-Jackson Rd., Jackson Co., $9,885 — widening, paving 4.386 mi. Sects. "L" and "Hanging Rock" Ohio River Rd., Lawrence Co., brick $90,761, bituminous macadam $82,332 — concrete paving 2.197 mi. Sect. "F" Cincinnati-Dayton Rd., Hamilton Co., $129,651—paving 2.65 mi. Sect. "A" Springfield-Troy Rd., Miami Co., concrete $63,706, bituminous macadam $72,921—paving 0.145 mi. Sect. "Perrysburg-Toledo-Grand Rapids Rd.," Wood Co., concrete $2,358, bituminous macadam $2,655—paving 8.079 mi. Sects. "S-1" and "S-2" Cincinnati-Zanesville Rd., Warren Co., concrete $213,629, bituminous macadam $213,624 — bituminous macadam paving 0.66 mi. Sect. "Tiffin West" Tiffin-Findlay Rd., Seneca Co., $20,670 — paving 0.771 mi. Sect. "N" Fremont-Perrysburg Rd., Sandusky Co., brick, incl. furnishing, delivering brick, $46,924, concrete $33,742.

O., Cleveland Heights—July 20, by City, brick, sheet asphalt or bituminous macadam paving Pennfield, Rosedale and Brentwood Rds. $100,000. F. A. Pease Engr. Co., Terminal Tower, Cleveland, engrs.

O., Columbus—July 21, by W. H. Duffy, dir. Service, grading, drainage, structures, curbing, brick or concrete paving 600 ft. Broadleigh Rd. from Broad St. to Fair Ave., $18,000—700 ft. Columbus St. from Oakwood to Wilson Aves., $16,520—1,200 ft. Genesee Ave. from Dresden to Hanmon Sts., $26,000—950 ft. Norwich Ave. from Faulft St. to Cleveland, Cincinnati, Chicago & St. Louis R.R., $18,750—1,274 ft. 6th St. from Markinson to Welch Aves., $19,570. R. H. Simpson, City Hall, engr.

Pa., Greensburg—July 17, by J. A. Kelly, clk. Bd. Comrs. Westmoreland Co., Court House, rein.-con. paving 21,455 ft. Mt. Pleasant-Scottdale Rd., Mt. Pleasant Boro and East Huntington Twp., Porter Ave., Scottdale Boro, Diamond St., Mt. Pleasant Boro in Mt. Pleasant and East Huntington Twps., 18, 20 and 24 ft. wide. W. A. Lynn, Court House, engr.

Pa., Phila.—July 28, by Bureau of Hys., Dpt. P. Wks., A. Murdoch, dir., City Hall Annex Schedule A, grading—Schedule B, grading and paving (assessment work)—Schedule C, asphalt paving (assessment work)—Schedule D, asphalt repaving—Schedule E, redressed granite block paving—Schedule H, furnishing and delivering electrical supplies — Schedule I, country road improving.

Virginia—July 28, by Dpt. Hys., Richmond, grading, drainage structures Route 604, Project S716A, Essex Co.; macadam paving 2 mi. Route 39, Project F641H1, Augusta Co.

Washington—July 28, by S. J. Humes, dir. State Hys., Olympia, grading concrete paving 3,576 sq.yd. Bway., in Everette, Snohomish Co. —2.7 mi. State Rd. 6, Spokane Co.—rein.con. slab bridge over Goose Creek, Wilbur, Lincoln Co.—concrete paving 2.7 mi. Spokane Co.—168 ft. steel pony truss bridge over Black River —rein.-con. girder overhead crossing on Northern Pacific R.R.—120 ft. rein.-con. girder bridge over Cedar Creek, all foregoing on State Rd. 9, Grays Harbor Co.—retimbering, redecking Adna Bridge, on State Rd. 12, Lewis Co.

Wash., Seattle—Comrs. King Co., Court House, bids about Sept. 2, grading, extending 7.75 mi. 1st Ave. S. $183,000. T. D. Hunt, co. engr.

Wyoming — July 20, by State Hy. Comn., Cheyenne, surfacing 5.213 mi. Moorcroft-Gillette Rd., Crook Co.—crushed lime rock surfacing 11.504 mi. Guernsey-Dwyer Rd., Platte Co.—23.3 mi. Wind River Rd., Teton Co.—oil treating 23.759 mi. Cheyenne-Wheatland Rd.—18.93 mi. County Rd. 75, both Laramie Co.—grading 5.011 mi. Lingle-Lusk Rd., Goshen Co. —13.515 mi. Rock Springs-Green River Rd., Sweetwater Co.—4.098 mi. Evanston Rd., Uinta Co.—41.03 mi. Dwyer West Rd.—8.664 mi. Wheatland-Orin Rd., both Platte Co.—grading, oiling 32.86 mi. Wamsutter-Rock Springs Rd., Sweetwater Co.—20.745 mi. Wheatland-Chugwater Rd., Platte Co.

Ontario—July 23, by R. M. Smith, deputy minister Hys., Dept. Hys., Ontario, concrete paving 0.35 mi. Belleville Bay Ridge approaches and 1.05 mi. approaches Trenton Overhead, Contr. 31-44—5.49 mi. Galt southerly to Brant Co. line, Contr. 31.45—1.1 mi. Wougall Ave. from Windsor city limits to point ½ mi. south of M. C. R. subway, Contr. 31-46—5.3 Paris Northerly to Brant Co. line, Contr. 31-47 or mixed macadam paving same road, Contr. 31-49—concrete paving 7 mi. Atherley southerly Contr. 31-48, or mixed macadam paving same road, Contr. 31-50— constructing Orchardville Bridge, Contr. 31-51—Blenheim Overhead Bridge, Contr. 31-52.

CONTRACTS AWARDED

Alabama—L. G. Smith, dir. hys., Montgomery, grading, guard rail, Bermuda planting, concrete paving 4.04 mi. Court St. in Montgomery to Selma Rd., on Mobile Rd., Montgomery Co., to J. B. McCrary Co., Citizens & Southern Bank Bldg., Atlanta, Ga., $47,219. State furnishes cement. Noted June 11.

Arizona—State Hy. Comn., Phoenix, grading, draining, placing cushion materials on 2.5 mi. Benson-Douglas Hy., Cochise Co., to W. Peper, 617 Heard Bldg., Phoenix, $46,906.

California—C. H. Purcell, engr. State Hy. Comn., Sacramento, grading 10 mi. Sect. A, Route 77, Mt. Shasta-Mt. Lassen Hy., Shasta Co., to N. Lovelace, 3433 N St., Sacramento, $92,933.

Calif., Salinas—C. F. Joy, clk. Monterey Co., grading, drainage structures, surfacing 2.5 mi. Watsonville-San Juan Rd., to Granite Construction Co., Watsonville, $31,782.

Calif., San Francisco—S. J. Hester, secy. Bd. P. Wks., curbing, sidewalks, asphaltic concrete paving Van Ness Ave. Extension, to Hauerbach Co., Hobart Bldg., $36,895. Noted June 11.

Calif., Ventura—Ventura Co., grading, asphaltic concrete paving Telegraph Rd., to M. M. Butler, 688 Polk St., $28,839. Noted Apr. 23.

Colorado—State Hy. Dpt., Denver, graveling 7.5 mi. road north and south of Saguache, Saguache Co., to Pople Bros. Constr. Co., Trinidad, $137,917. Noted July 8.

Colorado—State Hy. Dpt., Denver, graveling 2.95 mi. LaPlata Co., to J. H. Miller & Co., Denver, $97,838; 12.248 mi. El Paso Co., to Charles B. Owens, Denver, $143,370.

Conn., Stamford—Town, W. F. Joyce, town hall, asphaltic concrete paving Farms Rd., Riverbank and Roxbury Sts., to Bridgeport Constr. Co., 35 Mellon Ave., $76,870. Est. $75,000.

Delaware—State Hy. Dpt., Dover, clearing, grubbing grading, concrete paving 3.3 mi. Whitehall Beck-Mott's Corner, Contr. 172, to George & Lynch, Dover—3.515 mi. Brown's Church-Middleford, Contr. 180, to Highway Eng. & Constr. Co., Selbyville—grading, borrow, broken stone base course, concrete paving 3.674 mi. Port Penn-Delaware City, Contr. 186, to D. E. O'Connell & Sons, Ridley Park, Pa. Noted May 28.

Idaho—State Hy. Comn., Boise, reconstructing and oil processing 4.23 mi. Old Oregon Trail, between Lava Hot Springs and Bear Lake County line, Bannock and Caribou Counties, to Quinn Robbins Co., Boise, $103,517.

Ill., Bloomington—Bd. Comrs. McLean Co., graveling 5.8457 mi. Sect. O-MFT, to Rowe, Gibson & Weaver, Bloomington, $30,677. Noted June 4.

Ill., Galesburg—Bd. Local Impvts., grading, curbing, guttering, repaving 6 blocks South Cherry St., to Graham-King Constr. Co., 550 South Cedar St., $23,710. Est. $25,000. Noted July 6.

Ill., Monmouth—Warren Co., grading, graveling 2.5 mi. Greenbush Twp. and Cameron Rds., Warren Co., to Wisely Bros., Sheffield, $14,995 and $2,227 respectively—2 mi. Pleasant Point Rd., to Kridner Constr. Co., Monmouth, $11,855. Grand total $29,077.

Indiana—State Hy. Comn., Indianapolis, bituminous retread surfacing 17.871 mi. road, 20 ft., Huntington Co., to N. B. Putnam, Fort Wayne, $202,627. Est. $246,257. Noted June 11.

Indiana — State Hy. Comn., Indianapolis, asphaltic macadam paving 5.049 mi. road, 20 ft., Laporte Co., to A. W. Taylor Constr. Co., Laporte, $82,938. Est. $104,977. Noted May 28.

Indiana—State Hy. Comn., Indianapolis, bituminous retread surfacing 2.73 mi. Rd. 9, Contr. 152, 20 ft., to N. B. Putnam, Fort Wayne, $19,956; 3.399 mi. Rd. 69, Contr. 149, Posey Co., to M. R. Polk & Co., Oaktown, $23,937. Noted June 18.

Ind., Indianapolis — Bd. P. Wks., City Hall, widening, asphalt resurfacing East New York St., to Indiana Asphalt Paving Co., 2810 Columbia St., $59,306—Kentucky Ave. to W. D. Vogel Co., 506 Inland Bank Bldg., $18,197—and Shelby St., to J. N. Morgan & Sons, 1310 East 31st St., $13,400. Grand total $90,903. Noted June 25.

Ind., Terra Haute — Vigo Co., brick paving 4,435 ft. Samuel Tindall Rd., and 4,520 ft. John Gillan Rd., to J. A. Shepherd, 1802 South 10th St., $27,567 and $27,520 respectively. Est. $33,000 and $33,069 respectively. Noted June 18.

Iowa—State Hy. Comn., Ames, to C. F. Lytle Constr. Co., Sioux City, paving 2.954 mi. Winnebago Co. $64,448—to F. C. Bretz, Ayrshire, grading 4.8 mi. Van Buren Co. 16,159—to Dixon & Colgon, Mystic, graveling 2.6 mi. Appanoose Co. $2,304; 6.72 mi. same county $5,170—to W. T. Kelley, Des Moines, 1.35 mi. Clarke Co. $1,841; 1.64 mi. Clarke Co. $2,045; 2.4 mi. Van Buren Co. $5,158—to Lyman-Richley Sand & Gravel Co., Des Moines, 5.6 mi. Page Co. $7,545. Grand total $104,670.

Iowa — State Hy. Dpt., Ames, to Bryant Paving Co., Waterloo, paving 31.331 mi. Bremer Co. $65,533; 0.284 mi. Clinton Co. $5,981—to J. P. Abramson Constr. Co., 916 Hubbell Bldg., Des Moines, 2.225 mi. Dallas Co. $40,382; 5.725 mi. Polk Co. $138,863; 2.041 mi. Dallas Co. 13,403 — to W. Horrabin Contg. Co., Iowa City, $1,018 mi. Johnson Co. $45,304—to Bemis & Schlick, 503 South Surety St., Des Moines, 7.858 mi. Mahaska Co. $149,853 — to John Schacht & Son, Durant, 0.332 mi. Muscatine Co. $6,480; 0.685 mi. Muscatine Co. $14,193—to C. F. Lytle Constr. Co., Sioux City, 4.871 mi. Woodbury Co. $207,165; 1.764 mi. Woodbury Co. $50,836—to A. Mulvenna, Brighton, crushed stone surfacing 6.706 mi. Jones Co. $6,136; 3.695 mi. Jones Co. $7,236—to Langfitt & Co., Cedar Rapids, 9.15 mi. Linn Co. $5,735—to Lyman-Richey Sand & Gravel Co., Bankers Res. Life Bldg., Omaha, Neb., graveling

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Streets and Roads (Continued)

12.706 mi. Pottawattamie Co. $30,959 — to J. A. Carlson Constr. Co., Omaha, Neb., 11.666 mi. Adams Co. $67,464—to Mulgrew & Sons, Dubuque, 12.276 mi. Buchanan Co. $45,936; 2.048 mi. Delaware Co. $6,314; 2.691 mi. Jackson Co. $14,455 — to G. W. Condon Co., 233 Grain Exch. Bldg., Omaha, Neb., 12.276 mi. Cass Co. $26,143; 14.698 mi. Montgomery Co. $73,611; 12.897 mi. Page-Fremont Co. $56,987—to Shirley Constr. Co., Omaha, Neb., 8.327 mi. Dubuque Co. $88,439—to C. F. Betz, Sioux City, 0.811 mi. Jackson Co. 10,006 — to T. Mickle, Newton, 10.678 mi. Keokuk Co. $73,192—to J. B. Hannahs, Keokuk, 15.628 mi. Lee Co. $85,706—to Sargent & Roth, Keystone, 15.228 mi. Marion Co. $85,961. Grand total $1,422,271.

Ia., Ida Grove — Ida Co., grading 3.57 mi. road near Battle Creek, to W. H. Dugan & Sons, Omaha, Neb., $13,735 — 5.03 mi. road in Douglas Twp., to Specketer & Sherwood, Galva, $5,712—6 rein.-con. culverts on same road, to Christiansen Bros., Tyler, Minn., $4,794. Grand total $24,241. Noted June 25.

Ia., Jefferson—Greene Co., maintenance gravel surfacing 80 mi. trunk and local roads, to Pound & Clark, Scranton, $6,484—to C. A. Emery, Coon Rapids, $3,325—to N. E. Hendricks & Co., Scranton, $3,049. Grand total $12,858.

Ia., Webster City—Hamilton Co., graveling 19.25 mi. trunk roads, 28.25 mi. local county roads, resurfacing 66.5 mi. trunk and 2 mi. local roads, to H. R. Maudlin & C. A. Emory, Nevada, $15,365, and to Beu & Son, Sumner, $11,820—county bridges, to Hirt & Loder, Jewell, $15,700. Grand total $42,885.

Kansas—State Hy. Dpt., Topeka, bituminous blotter treating 17 mi. Project 7270, Wallace Co., to Cook & Cone, Ottawa, $8,014—concrete paving 1.661 mi. and 1.723 mi. Harvey Co., to Gieger & Rutherford, Leavenworth, $35,229 and $39,149 respectively—grading, bridge on 0.17 mi. Rush Co., to Bennett Bros. & Davis, Cottonwood Falls, $367 and $1,561 respectively. Grand total $84,320. Noted June 19.

Kan., Ottawa—Franklin Co., grading, culverts, surfacing 7.5 mi. Project BD-12-C, Michigan Valley Rd., 26 ft., to A. L. Cook, Ottawa, $39,379. Noted June 11.

Kan., St. Francis—City, 7 in. rein.-con. paving 18,800 sq.yd. streets, to Walters Bros., Manhattan, $32,751. Noted June 25.

Maryland—State Roads Comn., G. C. Uhl, chn., Baltimore, gravel surfacing 2.27 mi. Contr. Sm-83-84 St. Mary's Co., to Jarboe & Haughton, Mechanicsville, $31,207. Noted June 25.

Maryland—Baltimore State Roads Comn., G. C. Uhl, chn., concrete paving 4.34 mi. Contr. T-35-22, Talbot Co. to Phillips Bros., Salisbury, $61,803; gravel surfacing 2.69 mi. Contr. C-43-82 Calvert Co., to Southern Maryland Contg. Co., 20 East Lexington St., Baltimore, $24,390. Noted June 18.

Maryland—State Roads Comn., G. C. Uhl, chn., Baltimore, concrete paving 1.06 mi. Contr. S-52, Somerset Co., to Hanneman-Burroughs Co., Salisbury, $15,217; 6.65 mi. Contr. A-87-84, Allegany Co., to Cumberland Contr. Co., Cumberland, $233,362. Noted June 4.

Maryland—State Roads Comn., G. C. Uhl, chn., Baltimore, gravel surfacing 1.46 mi. Contr. Ch-106-82, Charles Co., to H. W. Hewitt & Sons, Valley Lee, $6,566; 2.08 mi. Contr. C-48-84, Calvert Co., to E. R. James, Havre De Grace, $21,658. Noted July 2, and 9.

Maryland—State Roads Comn., G. C. Uhl, chn., Baltimore, concrete paving 3.25 mi. Contr. Co-58-22, Cecil Co., to G. & L. Contg. Co., Maple Ave., Overlea, $39,165. Noted May 28.

Massachusetts—Dpt. P. Wks., State House, Boston, A. W. Dean, engr., bitulithic concrete paving 17,165 ft. hy. Halifax and Plympton, to M. F. Roach & Sons, Inc., 55 Spring St., East Bridgewater, $65,170—bituminous macadam paving 8,500 ft. Georgetown, to J. E. Watkins, 41 Powow St., Amesbury, $40,037—13,089 ft. Abington and Brockton, to Corrado & Lepore Constr. Co., 60 Weybosset St., Providence, $79,890—gravel and bituminous macadam surfacing 950 ft. Millis, to A. M. Custance & Co., Inc., 4 Shawmut Ave., Hudson, $13,598. Grand total $198,695.

Mass., Boston—Dpt. P. Wks., sheet asphalt paving Clementine Park, etc., Dorchester, to H. F. Malley, 96 Tyndale St., Roslindale, $29,071.

Mass., Boston—Dpt. P. Wks., J. A. Rourke, comr., bitulithic paving Glen Rd., Ward 11, to M. De Matteo, 15 Stella Rd., Roslindale, Est. $25,000.

Mass., Cambridge — Dpt. P. Wks., rein.-con. paving as specified, to Simpson Bros. Corp., 77 Summer St., Boston, at $2.57 per sq.yd. Est. $25,000 or more.

Mass., Melrose — Dpt. P. Wks., bituminous macadam paving Main St., separate contracts, $35,000.

Michigan—City Clerk Niles, grading, shaping, drainage structures, concrete paving 1.038 mi. MO11-31C-2, and 0.523 mi. FO11-31C-3, both Berrien Co., 40 ft. wide, to Hudson & Coons, East Lansing, for State Hy. Comn., Lansing, $48,108 and $26,814 respectively, both incl. cement. Noted June 18.

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Michigan—A. L. Burridge, div. engr., Cadillac, grading, drainage structures 11.612 mi. FO35-12C-3, Iosco Co., for State Hy. Comn., Lansing, to L. Garavaglia, 2223 Scott St., Detroit, $95,313 incl. cement. Noted June 18.

Michigan—A. L. Burridge, div. engr., Cadillac, grading, drainage structures 11.842 mi. FO40-11C-1 and FO5-15C-1, Kalkaska and Antrim Counties, for State Hy. Comn., Lansing, to L. D. Cool, Hastings, $50,962 incl. cement. Noted June 18.

Michigan—H. W. Hagaman, div. engr., 504 Eddy Bldg., Saginaw, grading, shaping, drainage structures, concrete paving 0.86 mi. MO76-27C-1, Shiawassee Co., for State Hy. Comn., Lansing, to C. A. Handeyside Constr. Co., 12-233 General Motors Bldg., Detroit, $19,583. Noted June 18.

Michigan—H. G. Oakes, div. engr., Plymouth, grading, drainage structures 4.808 mi. FO38-32, Contr. 1, Jackson Co., for State Hy. Comn., Lansing, to Adams & Lotte, Kalamazoo, $40,889 incl. cement. Noted June 18.

Michigan — J. T. Sharpensteen, div. engr., Escanaba, grading, shaping, drainage structures, 20 ft. concrete surfacing, 2.12 mi. FO36-13C-3 and 20 ft. concrete paving 7.754 mi. FO36-14C-2, Iron Co., for State Hy. Comn., Lansing, to H. Holmes, Crystal Falls, $46,383 and $141,182 respectively, both incl. cement.

Minnesota—State Hy. Dpt., St. Paul, grading, culverts 14.3 mi. S. P. 11-9, Sect. 3, to R. Whitmas, Bovey, $272,655—6.9 mi. S. P. 12-28, Sect. 1, to R. P. England, Mitchell, S. D., $73,741—18.8 mi. S. P. 64-24, Divs. A and C, to Adolphson & Huseth, Thief River Falls, $43,372. Grand total $389,768. Noted June 18.

Mo., St. Louis — Bd. P. Serv., City Hall, asphalt paving 7,410 sq.yd. Westminister Ave., to C. A. Moreno Co., Syndicate Trust Bldg., $44,068 — 3,340 sq.yd. Tholozan Ave., to Crean & Scott Constr. Co., 1242 Sublette Ave., $25,260—2,860 sq.yd. Wyoming St., to Asphalt Paving Co., 1328 Sublette Ave., $7,675 — warrenite bitulithic paving 2,935 sq.yd. Wyoming St., to Granite Bituminous Paving Co., Railway Exchange Bldg., $17,822. Grand total $94,825. Noted June 4.

Mo., St. Louis — Bd. P. Serv., City Hall, asphalt paving 5,715 sq.yd. Minika Ave., to Crean & Scott Constr. Co., 1242 Sublette Ave., $36,983—5,850 sq.yd. Wyoming St. and 5,220 sq.yd. Taylor Ave., to Flinn Paving Co., 1405 South 1st St., $33,880 and $31,231 respectively — warrenite bitulithic paving 7,360 sq.yd. Wyoming St., to Granite Bituminous Paving Co., Railway Exch. Bldg., $42,925 — grading, paving alleys in City Block 1657, to Creech Constr. Co., 4150 Bingham Ave., $3,164 — alleys in City Blocks 2802 and 5224, to A. Lewald, Inc., 5473 Delmar Blvd., $4,198. Grand total $152,291. Noted June 11.

Neb., Sidney—Curbing, guttering, grading, 7 in. rein-con. compacted paving 13,800 sq.yd. Street Impvt. Dist. 1, to Yant Constr. Co., Omaha Natl. Bank Bldg., Omaha, $30,850.

Nevada—Dpt. State Hys., Carson City, reconstructing road in Elko Co., to Nevada Rock & Sand Co., Inc., Reno, $102,231—oiling road, constructing bridge over Lower Virgin River, Clark Co. and oiling road in Douglass Co., to J. Casson, Hayward, Calif., $34,285 and $32,411 respectively—road in Humboldt Co., to Dodge Bros., Inc., Fallon, $70,156. Grand total $239,083.

New Jersey—State Hy Comn., Trenton, 9 in. rein.-con. paving 32,990 sq.yd. Morris and Essex Counties, to Frank Snead Co., Inc., Pompton Lakes, $197,690—constructing ramp connection, Newark, Essex Co., to McClintic-Marshall Co., Bethlehem, Pa., $1,807,600—furnishing, erecting structural steel, Hudson Co., to Nutley Contg. Co., 20 Harrison Ave., Nutley, $44,635. Grand total $1,249,925. Noted June 18

N. Y., New York—S. Levy, pres. Manhattan Boro. Municipal Bldg., asphalt paving West 143rd St., to C. D. Beckwith, Inc., Seneca Ave. and Edgewater Rd., $33,467—granite block paving East 100th St., to Columbia Eng. & Contg. Co., 401 Bway., $14,898—asphalt paving 28th St., to Meehan Paving & Constr. Co., 90 West St., $33,676. Grand total $82,041. Noted June 25.

N. Y., New York—S. Levy, pres. Manhattan Boro, Municipal Bldg., to Meehan Paving Co., 90 West St., asphalt paving York Ave., $14,556; East 13th St., $7,057—West 91st St., $12,319; 91st St., $10,760—to Premier Constr. Co., 367 Fulton St., granite block paving Moore St., $9,775. Grand total $54,467. Noted June 18.

N. Y., Syracuse—To G. Dickinson, 309 Basin St., petroleum sheet asphalt paving South Geddes St. $25,520; petroleum sheet asphalt resurfacing Onondaga Ave. $39,975; cutting back corners Sherwood and Hanley Ave., West Fayette and Hamilton Sts. and repairing pavement on Shotwell Pl. $10,908. Grand total $76,403.

Ohio — O. W. Merrell, dir. hys., Columbus, grading, concrete paving 5.177 mi. Franklin and Licking Counties, 30 ft., to Hill & Hill Co., Elyria, $144,431; widening, sheet asphalt paving 0.47 mi. Richland Co., 20 and 30 ft., to Mansfield Asphalt Paving Co., Mansfield, $29,817.

Ohio—O. W. Merrell, dir. hys., Columbus, to L. Dehmer, Tiffin, surface treating 13.4 mi. Ashland-Norwalk Rd., Ashland and Huron Counties, $24,616; 10.49 mi. Bucyrus-Tiffin Rd., Crawford Co., $25,859; 5.18 mi. Savannah-Vermilion Rd., Huron Co., $15,694—to N. B. Putnam, Deshler Hotel, Columbus, 4.33 mi. Hayesville-Nashville Rd., Ashland Co., $14,325; 10.61 mi. Upper Sandusky-Bellevue Rd., Findlay-Kenton Rd. and Marysville-Kenton Rd., Wyandot and Hardin Counties, $18,047 — to T. D. Van Camp Co., 55 East State St., Columbus, 14.2 mi. Ohio River and Labelle Rds., Lawrence Co., $20,799. Grand total $119,340. Noted June 25.

Ohio—O. W. Merrell, dir. hys., Columbus, sheet asphalt and new brick paving, incl. furnishing, delivering brick 1.338 mi. road, Ross Co., to Brewer & Brewer Sons, Chillicothe, $72,370; concrete paving 1.858 mi. road, Union Co., to Stellhorn & Beightler Co., 2061 Fairfax Rd., Columbus, $48,743. Noted June 25.

Ohio—O. W. Merrell, dir. hys., Columbus, trenching, subgrading, brick paving, incl. furnishing and delivering brick 1.75 mi. Brown Co., to Brewer & Brewer Sons, Inc., Chillicothe, $55,202—bituminous macadam paving 5.519 mi. Butler Co., to Christ & Beatty, Seven Mile, $146,364—2.907 mi. Wood Co., to Peerless Constr. Co., Fremont, $64,584—concrete paving 5.282 mi. Clinton Co., and brick paving, incl. furnishing, delivering brick 1.946 mi. Cuyahoga Co., to E. A. Freshwater & Sons, 312 Hazen Bldg., Cincinnati, $85,969 and $181,969 respectively—concrete paving 1.093 mi. Fulton Co., to McKechnie-Pierce Co., 1125 Woodruff Ave., Toledo, $23,699—0.939 mi. Ottawa Co., to Peters Bros., 729 Ewing St., Toledo, $18,835—concrete paving, incl. extending abutments 0.312 mi. Hamilton Co., to August J. Hinkle Constr. Co., Cincinnati, $17,357—rein.-con. paving 8.514 mi. Delaware Co., and concrete paving 5.221 mi. Williams Co., to W. L. Johnson Constr. Co., Hicksville, $169,509, and $108,544 respectively—5.701 mi. Preble Co., to Studebaker & Son, Greenville, $95,490—brick paving, incl. furnishing, delivering brick 2.854 mi. Cuyahoga Co., to Cleveland Trinidad Paving Co., Western Reserve Bldg., Cleveland, $262,881—3.087 mi. Guernsey Co., to R. Strawser, Inc., 852 North Cassady Ave., Columbus, $118,050—0.099 mi. Sect. "Leesburg-East" Cincinnati-Chillicothe Rd. and 0.469 mi. Sect. "Lynchburg" Wilmington-Sardinia Rd., both Highland Co., to H. R. Grandle, Leesburg, $5,018 and $17,134 respectively. Grand total, $1,370,605. O. W. Merrell, dir. hys., Columbus, cancelled bids to have been opened June 30, grading, drainage structures, brick or concrete paving 0.364 mi. Sect. "T" Toledo-Wauseon Rd., Lucas Co., $53,368—grading, drainage structures, brick, concrete or bituminous macadam paving 0.128 mi. Sect. "Frazeysburg" Newark-Coshocton Rd., Muskingum Co., $4,035—grading, drainage structures, brick paving 0.138 mi. Sect. "B" Canton-Canal Dover Rd., Stark Co., $8,882. Noted June 25.

O., Columbus—Comrs. Franklin Co., F. D. Connally, clk., widening, 4 m. bituminous macadam surfacing 1.86 mi. Olentangy River Rd., Pleasant Twp., to J. and L. Snouffer, Dublin, $30,527. Noted June 25.

Oregon—State Hy. Comn., Salem, concrete paving 1.16 mi. Pacific Hy., 24 ft., Clackamas Co., to Jacobsen-Jensen Co., 407 Stanton St., Portland, $39,992.

Pa., Pittsburgh—E. G. Lang, City County Bldg., to D. Pavia, 331 Ladson St., grading, curbing, paving Album St., $9,790; Black St., $4,996; Hailman St., $3,425—to D. Carapellucci, 130 Maytide St., Amanda St., $9,896; Owendale St., $31,595—to M. O'Herron Co., South 1st and McKeen Sts., Negley Ave., $9,571—to A. F. Jordano, 2886 West Liberty Ave., Dormont, Delmont St., $8,800—to Booth & Flinn Co., 1942 Forbes St., McIntyre Ave., $4,728; Marlow St., $29,025—to Parkview Constr. Co., Boquet St., Shady Ave., $4,337; 4th Ave., $3,297—to H. Butch, 2 Emma St., Kaufmann Way, $3,725—to McCrady Constr. Co., 237 4th Ave., Sinnett Way, $3,834—to McDonough & O'Toole Co., 514 Climax St., Spring St., $18,347; Lilac St., $25,891. Grand total $171,257. Noted June 25.

Texas—G. Gilchrist, state hy. engr., Austin, rein.-con. paving 181,721 sq.yd. Hy. 19, Houston and Anderson Counties, to T. L. James & Co., Inc., Ruston, La., $317,245. Est. $360,000. Noted June 18.

Utah—State Hy. Comn., Salt Lake City, grading, surfacing 19.228 mi. Midland Trail from Price to Carbon, Carbon Co., to A. O. Thorne, Springville, $145,322. Est. $184,680. Noted June 25.

Vermont—State Hy. Dpt., Montpelier, concrete paving 5.74 mi. hy. Barton, to Callan Constr. Co., Bay View Ave., Bristol, R. I., $156,715.

Wash., Seattle—King Co., grading, graveling 1.5 mi. Soos Creek-Berrydale Rd., to S. R. Gray, Puyallup, $25,587 — grading, concrete paving 11.707 sq.yd. Issaquah-Monohan Rd., to Moceri Bros., Thompson Bldg., $24,436. Noted June 18.

Streets and Roads (Continued)

Wash., Walla Walla—Walla Walla Co., grading, concrete paving 13,262 sq.yd. Lateral Hy. 3, to George Harding, Walla Walla, $34,788.

Wisconsin—State Hy. Comm. and Door Co. Hy. Com., Green Bay, grading, retread paving 24 mi. Door Co., to S. G. Hayes & Co., 910 South Michigan Ave., Chicago, Ill., $121,726. Noted June 29.

Wisconsin—State Hy. Comm. and Hy. Coms. Trempealeau and Vernon Counties, LaCrosse, to Nelson, Mullen & Nelson, 355 Gateway Bank Bldg., Minneapolis, Minn., grading 6.182 mi. Independence-Eleva Rd., $57,119 — 3.066 mi. LaFarge-Viroque Rd., $26,686 — to Interstate Constr. Co., Madison, crushed stone surfacing 2.682 mi. DeSoto-Viroque Rd. $8,207—to E. Muller, LaFarge, 3.066 mi. LaFarge-Viroque Rd. $11,039—to R. Blado, Tomah, constructing Turner Bridge, $2,509; Yttri Bridge $6,843; Schoolhouse Bridge $2,301—to R. H. Noffke, Norwalk, Grove and Getter Bridges $2,749—to Metzger & Son, Blair, Langhaugh and Missel Bridges, $2,399; 4 cattle passes $2,750—to S. Swenson, Mount Horeb, cattle passes $2,472—to E. Blank, Cochrane, Skrison and Melness Bridges, $3,998. Grand total $129,072. Noted June 25.

Wis., Milwaukee—Dpt. P. Wks., City Hall, to Parkinson Constr. Co., 3517 West Highland Ave., paving alley between North 17th and North 18th Sts., $783—alley between North 17th and North 18th Sts., $1,718—alley between East Conway and East Homer Sts. $1,192—to Bodemann Constr. Co., 2803 West 55th St., alley between North 45th and North 46th Sts. $5,499; West Mount Vernon Ave., $13,146; West Fairmount Ave., $3,176—to A. J. Koch, 5332 North Holton St., South 65th St. $2,360. Grand total $27,874.

Wis., Shorewood—Village, paving North Lake Dr., to A. J. Koch, 5332 North Holton St., Milwaukee, $56,833.

B. C., Vancouver—Constructing sidewalks, to E. A. Anderson, 306 East 20th Ave., $21,929—asphaltic concrete paving, to Columbia Bitulithic Ltd., Granville Island, $25,263—asphaltic concrete paving, to Carter-Halls-Aldinger Co., 510 West Hastings St., $4,915—concrete paving, to G. W. Ledingham & Co. Ltd., 348 East 8th Ave., $47,532. Grand total $99,639.

Man., Winnipeg—City Council paving north side Portage Ave., to Canadian Bitumius (Western) Co. Ltd., Winnipeg, $30,000.

EXCAVATION, DRAINAGE, IRRIGATION, LEVEES, RIVER AND HARBOR

PROPOSED WORK

Ia., Sioux City—City, E. V. Moone, clk., preliminary plans flood protection work in Greenville Dist. $100,000. L. Hintgen, city engr.

BIDS ASKED

Ia., Sioux City—July 19, by E. V. Moone, city clk., City Hall, straightening Perry Creek. $50,000. L. Hintgen, city engr.

Mass., Scituate—July 21, by Dpt. P. Wks., A. W. Dean, engr., concrete sea wall at Sand Hills. $75,000 appropriation granted.

Neb., Lincoln—July 25, by Comrs. Lancaster Co. Sanitary Dist. 1, W. C. Frampton, secy., 522 Bankers Life Bldg., deepening, widening Salt Creek, in Sect. 7-10-7. Scott & Scott, 522 Bankers Life Bldg., engrs.

Tex., Wichita Falls—Aug. 10, by Wichita Co. Dr. Dis. 2, c/o C. M. Crowell, pres., and Wichita Co. Development Dist. 1, c/o N. H. Martin, secy., earth work, structures in canals, laterals, drains, ditches, approaches, other improvements, incl. 192,447 yd. earth excav., 116,279 B. M. lumber, placing flumes, culverts, protection structures, etc.

CONTRACTS AWARDED

Ark., England — Bd. Directors Plum Bayou Drainage Dist., N. B. Beakley, pres., repairing slopes and restoring grade 40 mi. levee along Arkansas River, Pulaski and Jefferson Counties, to O. Kochititzky, England, $31,750. Est. $88,000. Noted June 25.

Mass., Boston — Commonwealth of Massachusetts, Dpt. P. Wks., State House, dredging in harbor, main ship channel and wharves along Atlantic Ave., to Bay State Dredging & Contg. Co., 62 Condor St., East Boston, $46,220.

Bond Elections

Coming Bond Elections

Waterworks Impvts.—Huntsville, Mo., $25,000. E. T. Archer & Co., Kansas City, engr.

Waterworks Impvts.—Elena, Wash., July 25. $30,000.

Irrigation System—Cameron Co., Tex., Water Impvt. Dist. 19, c/o W. A. Trimps, pres. Harlingen, A. Tamm, Harlingen, engr. $750,000.

Bonds Voted

Waterworks Impvts. and Sewer Extensions — Longview, Tex., $70,000.

Waterworks—Salt Lake City, Utah, H. Jessen, city engr. $2,000,000.

Drainage Work—Wagoner, Okla., $90,000.

Armory—Danville, Va., $150,000.

FEDERAL GOVERNMENT

PROPOSED WORK

Calif., Riverside — INCINERATOR — Con. Q. M., March Field, rejected bids June 9, incinerator. Noted May 21.

D. C., Wash. — LIBRARY ADDITION — At office D. Lynn, archt. Capitol, addition to Library of Congress.

D. C., Wash.—LIBRARY ANNEX—At office D. Lynn, archt. Capitol, annex to Library of Congress.

D. C., Wash.—OFFICE—At office D. Lynn, archt. Capitol, soon takes bids Senate Office Building wing. $1,500,000. Noted June 18.

Ill., Rock Island—SEWER, etc.—U. S. Eng. constructing combination sewer and drainage system on Rock Island.

Ind., Auburn—POST OFFICE—Treas. Dpt. at office Sup. Archt., U. S. Inspection Station. $59,100.

Michigan — DREDGING — U. S. Eng., Black River. $20,000.

N. J., Englewood—POST OFFICE—Treas. Dpt. at office Sup. Archt., sketches 2 story, basement, brick, steel. West St. and Fallman Pl. $280,000.

Tenn., Memphis — WINCHES — U. S. Eng., McCall Bldg., 2 heavy duty winding winches, for 32 in. dredges under construction.

Tex., Randolph Field—HANGAR APRONS, etc.—Con. Q.M. revised plans hangar aprons, incl. 202,000 sq.ft. $125,000. Former bids rejected. Noted June 11.

Utah—RESERVOIR, etc.—Bureau Reclamation, Denver, Colo., preliminary plans Hyrum Reservoir, canal, dam. $900,000. R. F. Watter, Denver, Colo. ch. engr.

Vt., Derby Line—STATION—Treas. Dpt. at office Sup. Archt., 1 story inspection station. $93,000.

BIDS ASKED

Ala., Albertville—POST OFFICE—Aug. 6, by Treas. Dpt. at office Sup. Archt., U. S. Post Office; adv. E. N.-R. July 16.

Conn., New London—FLOOD LIGHTING—July 23, by Coast Guard, flood lighting over stadium, at Coast Guard Academy.

California — ROADS — July 28, by C. H. Sweetser, dist. engr. Pub. Rds., 461 Market St., San Francisco, bituminous treating 3.74 mi. Sect. "B" Long Barn-Stoddard Springs-Route 38, Sonora Natl. Forest Hy., Tuolumne Co.; 3.085 mi. Sect. "B" Route 35, Ebbetts Pass Natl. Forest Hy., Calaveras Co.

Calif., Monterey—BREAKWATER—Aug. 6, by U. S. Eng., Custom House, San Francisco, furnishing, placing 200,000 tons stone, for rock-mound breakwater to protect Monterey Harbor. Noted July 2.

Calif., San Diego—ELECTRICAL CRANE—Spec. 6472 — July 28, by Pub. Wks. Officer, 11th Naval Dist., 5 ton, 46 ft. 5 in. span, center to center of runway rails, traveling bridge crane equipped with 3 phase, 220 volt, 60 cycle motor.

D. C., Wash.—STEEL, etc.—July 23, by A. L. Flint, genl. purch. officer, steel, billets, pig iron, Schedule 2670.

D. C., Wash.—SUPREME COURT—At office D. Lynn, archt. of Capitol, bids about July 15, superstructure new supreme court. $9,740,000. Noted May 7.

Ga., Atlanta — POST OFFICE — July 22, by Treas. Dpt. at office Sup. Archt., tunnel and founds. for U. S. Post Office; adv. E. N.-R. July 16. Noted Apr. 16.

Ga., Eatonton—POST OFFICE—July 23, by Treas. Dpt. at office Sup. Archt., U. S. Post Office.; adv. E. N.-R. July 16.

Illinois and Missouri—PILING DIKES—July 29, by U. S. Eng., 428 Customhouse, St. Louis, Mo., 500 to 1,200 lin.ft. piling dikes, at Elize Towhead, Ill.; 1,500 to 3,000 lin.ft. at Commerce Island, Mo.; 500 to 1,200 lin.ft. at Harlow Island, Mo.; 2,000 to 3,500 lin.ft. at Wilson Island, Mo.; adv. E. N.-R. July 16.

Ind., Fort Wayne—POST OFFICE—Aug. 14, by Treas. Dpt. at office Sup. Archt., U. S. Post Office and Court House (except elevators, dumbwaiters, electric fixtures); adv. E. N.-R. July 16.

Ind., South Bend—POST OFFICE—July 31, by Treas. Dpt. at office Sup. Archt., plans by Austin & Shambleau, South Bend, U. S. Post Office, Jefferson and Main Sts. 900,000. F. H. Sprague, 205 West Wacker Dr., Chicago, Ill., archt. Noted Apr. 9.

Kan., Fort Leavenworth—HANGAR—July 29, by Con. Q. M., air corps hangar with annexes and boiler house. $83,700.

Kan., Fort Riley—HANGAR, etc.—July 29, by Con. Q. M., double hangar with 2 annexes and boiler house.

Ky., Barbourville—POST OFFICE—Aug. 6, by Treas. Dpt. at office Sup. Archt., U. S. Post Office; adv. E. N.-R. July 16.

La., New Orleans—BOILER REPAIRS—July 24, by Treas. Dpt. at office Sup. Archt., repairs boilers at U. S. Custom House.

La., Shreveport — DISTRIBUTION SYSTEM, etc. — Aug. 7, by Con. Q. M., Barksdale Field, electric distribution system, main entrance structures at Barksdale Field; adv. E. N.-R. July 16.

Me., Belfast—HEATING BOILER—July 20, by Treas. Dpt. at office Sup. Archt., heating boiler, brass water piping in U. S. Post Office.

Maryland — DREDGING — July 31, by U. S. Eng., Custom House, Baltimore, 30,000 cu.yd. material in Broad Creek, Pocomoke Sound; adv. E. N.-R. July 16.

Md., Chesapeake City—BRIDGE—Aug. 4, by U. S. Eng., Wilmington, Del., rein.-con. by bridge over Back Creek, here; adv. E. N.-R. July 16.

Mass., Rutland — HOSPITAL — Vet. Bu., Arlington Bldg., taking bids 2 story, tuberculosis sanitorium addition, incl. recreation building, warehouse, brick. $175,000. Noted Feb. 19.

Mich., Selfridge Field — WATER MAINS — July 24, by E. J. Walters, Con. Q. M., 8 and 10 in. c.i. water supply mains connecting Selfridge Field with Mount Clemens Water Supply, $27,000; sewage disposal plant, $50,000.

Missouri—REVETMENT—July 24, by U. S. Eng., 428 Custom House, St. Louis, 3,500 to 6,000 lin.ft. standard revetment, in Missouri River at Howard Bend; adv. E. N.-R. July 16.

Mo., St. Louis—DREDGING—Aug. 4, by U. S. Eng., one 24 in. steam driven stern-wheel pipe line dredge No. 7.

Mo., Springfield—HOSPITAL—Bureau Federal Prisons, S. Bates, superv., bids about Sept. 1, 4 story hospital, 2 story, basement acute building, 2 story, basement continued treatment building, 2 story, basement infirmary, 2 story, basement storehouse, 1 and 2 story mess hall and auditorium, 1 story, basement laundry, two 2 story dormitories, four 2 story residential style staff buildings. $2,500,000. Jeanes & Marlow, 420 Lexington Ave., New York, archts. J. A. Wetmore, c/o Treas. Dpt. Wash., D. C., acting superv. archt. Noted Apr. 23.

N. Y., New York—POST OFFICE—Aug. 20, by Treas. Dpt. at office Sup. Archt., superstructure U. S. Post Office (except elevators, dumbwaiter and mail handling equipment); U. S. Parcel Post Building; adv. E. N.-R. July 16. Noted Apr. 9.

N. Y., Plattsburg Barracks — GYMNASIUM, etc. — July 28, at office Con. Q. M., gymnasium, theatre; adv. E. N.-R. July 16.

N. Y., Sumount—NURSES' BUILDINGS, etc.—Aug. 24, by Vet. Bu., Arlington Bldg., nurses' buildings, roads, grading and drainage.

Pa., Carlisle Barracks—DISPOSAL SYSTEM—July 30, at office Con. Q. M., sewage disposal plant; adv. E. N.-R. July 16.

Texas—DREDGING—Aug. 10, by U. S. Eng., Galveston, dredging Sabine-Neches Waterway; adv. E. N.-R. July 16.

Va., Langley Field—QUARTERS—Aug. 10, at office Con. Q. M., Fort Monroe, 18 single company officers quarters; adv. E. N.-R. July 16.

Va., Langley Field—SIDEWALKS, etc.—July 21, by Con. Q.M., Fort Monroe, sidewalks, roads, curbs, N.C.O. Area.

Va., Woodstock—POST OFFICE—July 24, by Treas. Dpt. at office Sup. Archt., U. S. Post Office.

Va., Yorktown—DISTRIBUTION SYSTEM—July 20, by O. G. Taylor, Colonial Natl. Monument, Dpt. Interior, Natl. Park Serv., installing water distribution system, incl. mains, valves, hydrants.

Washington—PUMPING UNITS—Aug. 17, at office Bureau Reclamation, Custom House, Denver, Colo., 2 direct pumping units for Wippel Pumping Plant, Kittitas Div., Yakima Project; adv. E. N.-R. July 16.

CONTRACTS AWARDED

Calif., March Field—PAVING, etc.—Con. Q.M., paving, walks, curbs and grading, to W. J. Brand, 219 Palm Ave., Riverside, $59,500.

Calif., Riverside—GAS, WATER, etc.—Con. Q. M., March Field, gas, water and sewage for 61 buildings, to B. B. Garrett Co., 3333 South Pacific Ave., San Pedro, $14,445. 7 in. concrete paving 40,000 sq.yd., to W. J. Brand, 219 Palm Ave., $59,500. Noted May 21.

D. C., Anacostia—BARRACKS—Spec. 6404—Yards & Docks, Navy Dpt., barracks and boiler plant at Naval Air Station, to Worsham Bros., Empire Bldg., Knoxville, Tenn., $251,866. Noted June 4.

Fla., Key West—COURT HOUSE—Treas. Dpt. at office Sup. Archt., U. S. Post Office, to A. Blair, 1st Natl. Bank Bldg., Montgomery, Ala., $338,844. Noted June 11.

Ind., Linton—POST OFFICE—Treas. Dpt. at office Sup. Archt., U. S. Post Office, to Charles H. Barnes, Logansport, $42,980. Noted June 18.

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Federal Government Work (Continued)

Me., Machias — BOAT HOUSE, etc. — U. S. Coast Guard, 408 Atlantic Ave., Boston, Mass., boat house, laundry at Cross Island, to J. H. Simonds, 216 Federal St., Portland, $10,291. Noted June 18.

Mass., Lynn — DREDGING — U. S. Eng., 1,926,800 cu.yd. in Lynn Harbor, to G. H. Breymann & Son, 17 Battery Pl., New York, at $0.0475 per cu.yd. Noted June 18.

Mass., Winthrop—HOSPITAL—Con. Q. M., 2 story, basement, brick, steel, at Fort Bank, to M. Spinelli & Sons, 333 Washington St., Boston, Mass., $144,900. Noted May 21.

Mich., Bay City—POST OFFICE—Treas. Dpt. at office Sup. Archt., U. S. Post Office, to Ideal Constr. Co., Gary, Ind., $313,000. Noted June 11.

N. J., Lakehurst — BARRACKS — Yards & Docks, Navy Dpt., 3 story, basement, 122 x 245 ft. barracks and office quarters, to McCormick-Lenham Co., 40th and Chestnut Sts., Phila., Pa., $334,568; dirigible hangar, to Seacoast Iron Wks., Inc., Oakland St., Red Bank. Est. $150,000. Noted June 11.

N. Y., Fort Wadsworth—QUARTERS—Con. Q. M., 2 double sets officers quarters, to W. F. Martens, 8 Eastland Ave., Rochester, $45,400. Noted June 11.

O., Conneaut—DREDGING—U. S. Eng., Federal Bldg., Buffalo, N. Y., 163,000 cu.yd. in outer Conneaut Harbor, to Amer. Constr. Co., Marion Bldg., Cleveland, at $0.286 per cu.yd. total $46,618. Noted May 14.

R. I., Quonset Point—TENT FLOORS—Con. Q. M., Providence, tent floors, water and sewerage system extensions, to C. and D. Wells, 239 India Ave., Providence, $13,089. Noted June 4.

Tennessee and Georgia—ROAD—Con. Q. M., James Bldg., Chattanooga, Tenn., rebuilding and resurfacing Missionary Ridge Crest Rd., to J. J. Higgins, Jr., Macon, Ga., $150,185. Noted May 28.

Tennessee and Mississippi — ROAD — Con. Q. M., 1225 James Bldg., Chattanooga, Tenn., concrete paving road from Shiloh Natl. Park, Tenn. to Corinth, Miss., incl. 20 ft. span bridge, culverts, to J. M. Allen Co., Chelbin Bldg., Chattanooga, Tenn., $260,141. Noted May 21.

Tenn., Chattanooga—ROAD, etc.—Con. Q. M. Fort Oglethorpe, road in National Cemetery, to Carter Constr. Co., 923 Carter St., $11,574; lodge building, to E. G. Maxwell, Chattanooga, $9,545; comfort station and caretaker's quarters at Lookout Mountain, to Smith Bros., 213 East 10th St., $11,953; retaining wall, to J. H. Stein Co., James Bldg., $570; fence, to Brown Fence Co., 1616 Broad St., Chattanooga, $499. Grand total $34,141. Noted May 14.

Texas—LIGHTS—Dpt. Commerce, Div. Airways, lightings on Albuquerque-Amarillo Sect., Amarillo-Los Angeles Airway, to R. C. Whitlock, Colorado Springs, Colo., $35,885.

Tex., Houston—POST OFFICE, etc.—Treas. Dpt. at office Sup. Archt., 1, 2 and 4 story, basement, brick, steel post office and court house, Capitol, Rusk and San Jacinto Sts., to R. E. McKee, 1932 Texas St., El Paso, $514,900. Noted May 21.

Virginia—GRADING, etc.—Pub. Rds., Willard Bldg., Wash., D. C., grading, connecting hy. from Panorama to Big Meadows, to Albert Bros., Salem. Noted June 22 Daily.

Virginia—ROAD—Pub. Rds., Willard Bldg., Wash., D. C., grading 22.07 mi. roads in Shenandoah Natl. Park, to West Virginia Constr. Co., Huntington, W. Va., $171,002. Noted June 26.

Va., Langley Field—HANGARS, etc.—Con. Q.M., 11 hangars, annexes, connecting bays, power house, to M. H. Serbel Co., Detroit, Mich., $498,000.

T. H., Oahu—AMMUNITION DEPOT—Spec. 6101—Yards & Docks, Navy Dpt., 131 buildings, 11.5 mi. railroad, and 14.75 mi. roads, to Thomas Haverty, 316 East 8th St., Los Angeles, Calif., $2,000,000. Noted Apr. 16.

FEDERAL POWER COMMISSION

Applications for License and Permits
Licenses

1166—Buzzard Hill Mine, Inc., Happy Camp, Calif., wants license small project on Independence Creek, within Klamath Natl. Forest, Siskiyou Co.

1167—Arizona Power Co., Prescott, wants license transmission lines within Prescott Natl. Forest in Yavapai Co.

1168—California-Oregon Power Co., 58 Sutter St., San Francisco, Calif., wants license transmission line on public lands within Josephine and Douglas Counties, Ore.

RAILWAYS

PROPOSED WORK

Colorado—Denver Rio Grande Western R.R. Co., A. O. Ridgeway, ch. engr., Equitable Bldg., Denver, preliminary plans 41 mi. railroad known as Dotsero Cutoff, extending from Dotsero on Moffat Rd. to Orestod. $3,800,000.

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BIDS ASKED

New York—July 21, at office Dpt. Correction, State Office Bldg., Albany, track and trestle at Clinton Prison, Dannemora; adv. E. N.-R. July 16.

Oklahoma—See "Contracts Awarded."

CONTRACTS AWARDED

Oklahoma—Atchison, Topeka & Santa Fe R.R. Co., G. W. Harris, ch. engr., 80 East Jackson Blvd., Chicago, Ill., track work in connection with track elevation project from Southwest 21st to Northwest 8th St., Oklahoma City, own forces. Total $1,500,000.

SUBWAYS AND TUNNELS

BIDS ASKED

Pa., Phila—July 28, by Dpt. City Transit, City Hall Annex, C. E. Myers, dir., Contr. 325, Broad St. Subway, West Philadelphia Branch, tracklaying Ridge Ave. and 8th St., 3 m. single track measurement, 2 m. Class B concrete construction and 1 m. Class A channel construction.

Pa., Phila.—July 28, by Dpt. City Transit, C. E. Myers, dir., City Hall Annex, Contr. 250, Market St. Subway, pedestrian concourse, south side 12th St.

CONTRACTS AWARDED

Pa., Phila.—Dpt. City Transit, City Hall Annex, C. E. Myers, dir., Contr. 316, station finish, Ridge Ave. Subway, to Kober Contrg. Co., 1616 West Thompson St., $61,705. Noted June 18.

GRADE CROSSINGS

PROPOSED WORK

N. Y., Binghamton—Erie R.R. Co., 50 Church St., New York and 90 West St., New York, c/o A. B. Cohen, Binghamton, soon lets contract eliminating Liberty St. Grade Crossing, $594,736.

N. Y., Oyster Bay—Long Island R.R. Co., A. C. Watson, ch. engr., Pennsylvania Sta., New York, eliminating Carman Mill Rd. Crossing, west of Amityville Station, Nassau Co. $188,900.

N. Y., Salem—Delaware & Hudson R.R. Co., J. MacMartin, ch. engr., Albany, eliminating grade crossing on Cambridge-Salem State Hy., 2 mi. south of station. $108,000.

Okla., Oklahoma City—Atchison, Topeka & Santa Fe R.R. Co., G. W. Harris, ch. engr., 80 East Jackson Blvd., Chicago, Ill., soon takes bids 13 steel, rein.-con. underpasses or subways.

BIDS ASKED

N. Y., Yorktown — July 28, by Westchester Co. Park Comn., J. Downer, ch. engr., 72 West Pondfield Rd., Bronxville, undercrossing at Crompond St., and overcrossing at Jefferson Valley Rd., in Bronx Parkway extension, Eastern State Parkway Connection, Contr. 341; adv. E. N.-R. July 16.

CONTRACTS AWARDED

W. Va., South Charleston—City and Chesapeake & Ohio R.R. Co., C. W. Johns, ch. engr., Richmond, Va., undergrade crossing A St. and Montrose Dr., to Langhorne & Langhorne, Richmond, Va., $34,766.

DAMS

PROPOSED WORK

Tex., San Benito—International Waters Comn., c/o F. F. Crecelius, asso. engr., San Benito, preliminary surveys storage dam system between here and Big Bend. $10,000,000.

PIERS AND WHARVES

PROPOSED WORK

N. Y., New York—PIERS—Dpt. Docks, Pier "A", Battery Pl., bids early in August, cofferdam piers from 47th to 50th Sts. $7,000,000. Noted May 21.

BIDS ASKED

R. I., Providence — WHARF — July 29, by H. E. Winson, chn. Harbor Comn., 2 story wharf, structure and pier shed on waterfront, $75,000 bond, P. Sarle, 95 Fountain St., engr. Noted June 25.

CONTRACTS AWARDED

Tex., Houston—WHARF, etc.—Harris Co. Navigation Co., c/o J. R. Waite, dir., repairing, remodeling substructure of wharf 11, Houston Channel, incl. replacing present wood piling with rein.-con. piling, changing structure, to Southwest, L. E. Myers Co., Allen Bldg., Dallas, 112,053. Noted June 4.

AIRPORTS

PROPOSED WORK

Ala., Birmingham—Albama Natl. Guard, 31st Division, military airport, incl. administration building, 2 hangars, adjoining Birmingham Muncipal Airport. $142,000.

Calif., San Francisco—City and San Francisco Co., steel I-beam trolley ways, one ton hoists and compressor units at Mills Field Municipal Airport. M. M. O'Shaughnessy, city engr.

Pa., Pittsburgh—Comrs. Allegheny Co. returned bids unopened, on airport lighting and miscellaneous electrical work, for Mifflin Twp. Airport, near here. $65,000. Will readvertise. S. L. Roush, County Office Bldg., archt.

GRAIN ELEVATORS

CONTRACTS AWARDED

Minn., Minneapolis — GRAIN ELEVATOR — Archer-Daniels-Midland Co., 600 Roanoke Bldg., grain elevator storage addition, 29th Ave. S. E. and Chicago, Great Western R.R. Co. tracks, to McKenzie-Hague Co., 422 Corn Exch. Bldg., $750,000; 25,000 tons reinforcing steel, to Laclede Steel Co., Arcade Bldg., St. Louis, Mo. at about $1.50 per ton, base. Excavation work now under way.

Neb., Fremont — GRAIN ELEVATOR — Farmers Natl. Grain Corp., 500,000 bu. grain elevator addition, rein.-con., to Jones-Hettelsater Constr. Co., Mutual Bldg., Kansas City, Mo. Est. $75,000.

Wash., Spokane — GRAIN ELEVATOR — Farmers Natl. Grain Corp., 750,000 bu. wheat elevator, to Alloway & George, Hutton Bldg., $250,000. Awarded June 22.

POWER AND LIGHTING

BIDS ASKED

New York—July 24, by Bd. Transportation, J. H. Delaney, chn., 250 Hudson St., New York, furnishing, installing telephone and emergency alarm equipment for portion Independent System City-owned Rapid Transit Railroads, Manhattan, Brooklyn and Queens Boros.

N. Y., Dannemora—Aug. 4, by Dpt. Correction, W. N. Thayer, Jr., comr., Albany, electric transmission line for additional water supply, at Clinton Prison and Dannemora State Hospital; adv. E. N.-R. July 16.

CONTRACTS AWARDED

New York—Bd. Transportation, J. H. Delaney, chn., 250 Hudson St., New York, furnishing, installing telephone emergency system, Forest Hills, to Henry Ihle, Inc., 581 St. Johns Pl., Brooklyn, $14,813; in subway and Woodhaven, to M. C. Seelig, 153 Pierrepont St., Brooklyn, $14,961. Noted July 9.

PARKS AND SPORTS

PROPOSED WORK

N. J., North Long Branch—H. I. Braun, archt., 191 Bway., Long Branch, bids probably in September on revised plans 1 story, basement, brick, steel bathing pavilion, Ocean Ave., for S. A. McNair, 388 Ocean Ave., Long Branch. $200,000. Noted Mar. 19.

N. Y., Piermont—H and H Corp., c/o Lucht & Anderson, archts., 432 Palisade Ave., Cliffside, N. J., will not build 2 story, basement, brick bath houses, pavilion and swimming pool. $150,000. Project abandoned. Noted Feb. 12.

BIDS ASKED

N. J., Bayonne—See "Contracts Awarded."

N. Y., Brooklyn—July 21, by Park Bd., W. R. Herrick, pres. Park Dpt., Arsenal Bldg., Central Park, New York, grading section Marine Park, north of Avenue U.

N. Y., New York—July 21, by Park Bd., W. R. Herrick, pres. Park Dpt., Arsenal Bldg., Central Park, 5 foot chain link fences, gates around various lawns, Morningside Park; improving Mosholu Parkway Athletic Field, 201st St. and Webster Ave.; tree guards, gratings, frames, concrete edging on "Mall" in Central Park; installing wading pool, appurtenances, Thomas Jefferson Park, near East 114th St.; asphalt paving Girls' Playground, Hamilton Fish Park.

CONTRACTS AWARDED

N. J., Bayonne—Bd. City Comrs., City Hall, grading, concrete walks for recreation center at Newark Bay between 25th and 29th Sts., day labor. $200,000. W. Clarkson, city engr. Noted July 9.

UNCLASSIFIED

PROPOSED WORK

N. Y., New York—ELEVATORS—Supt. P. Wks., at office Bd. Trustees New York State Roosevelt Memorial Museum, Museum of Natural History, 15 West 77th St., soon takes bids elevators for Roosevelt Memorial Wing.

N. Y., New York—MORGUE, etc.—Dpt. Hospitals, Municipal Bldg., plans by Van Wart & Wein, 347 Madison Ave., 2 story, 33 x 100 ft. morgue and laboratory, opposite 125th St. and Wards Island, $100,000. **Maturity later.**

N. Y., Queens Village—UNDERPINNING, etc. —New York & Queens Electric Light & Power Co., 40-22 Lawrence St., Flushing, underpinning, found. work for bridge approach, Roosevelt Ave. and Lawrence St. $30,000.

N. D., Dickinson—COAL DOCK—Northern Pacific Ry. Co., B. Blume, ch. engr., Railroad Bldg., St. Paul, Minn., 1 coal dock. $50,000. **Maturity soon.**

BIDS ASKED

Calif., Los Angeles—CONDUIT—Los Angeles Co. taking bids rein.-con. conduit, incl. 11,500 cu.yd. excav., 2,000 cu.yd. backfill, 1,450 cu.yd. "A" rein.-con. and three cu.yd. "B" mass concrete, fencing, in 8th St. between Anita St. and Harding Ave., and Harding Ave., San Fernando.

Unclassified (Continued)

Mass., Boston—RAPID TRANSIT STATION, etc.—July 23, by Dpt. P. Wks., rapid transit station and traffic circle, Cambridge and Charles Sts., incl. widening street to 120 ft., underground foot passages, platform shelter, escalators, lighting. J. A. Rourke, Dpt. P. Wks., comr.

N. Y., New York—MORGUE—Dpt. Hospitals, Municipal Bldg., bids about Aug. 1, general contract 2 story, basement, brick, steel, Randall's Island opposite 125th St. Van Wart & Wein, 347 Madison Ave., archts.

Pa., Phila.—SUMP PUMP UNITS—July 28, by Dpt. City Transit, City Hall Annex, C. E. Myers, dir., Contr. 314, 5 electrically operated centrifugal sump pump units, complete for Broad St. Subway, West Philadelphia Branch. Noted June 11.

Tex., Houston—SHED—Aug. 1, by Harris Co. Navigation Dist., c/o J. Russell Waite, dir. Port Houston, 1 story, 125 x 585 ft., steel, monolithic concrete shed, Houston Port. G. P. Simpson, Houston, engr. Noted June 25.

Va., Norfolk—FIRE ENGINES—July 20, L. City Purchasing Agent, fire engines, two 1,000 gal. triple combination motor pumping engines, complete f.o.b. Fire Headquarters. $25,000.

CONTRACTS AWARDED

Minn., Minneapolis—ELEVATORS—Municipal Bldg., Comn., 2 passenger elevators in city and county building, to Otis Elevator Co., 412 6th Ave. S., $34,145. Noted Dec. 25.

N. Y., Ossining — ELEVATORS — Dpt. Correction, State Office Bldg., Albany, electric elevators in Shoe Shop, Sing Sing Prison, to Burwak Elevator Co., 227 Fulton St., New York, $6,363. Noted May 7.

MATERIALS

BIDS ASKED

WATER PIPE FITTINGS—**Oakland, Calif.**—July 22, by J. H. Kimball, secy., East Bay Municipal Utility Dist., furnishing, delivering 900 c.i. bell and spigot water pipe fittings, 4- to 12-in. in diam.

GRAVEL, etc.—**Mississippi**—July 20, by State Hy. Comn., Tower Bldg., Jackson, washed road gravel, sand-clay gravel, clay gravel, surface treating gravel, concrete gravel, concrete sand, motor oils, lubricating greases. C. M. Williamson, dir.

ASPHALTIC CEMENT—**Long Island City, N. Y.**—July 21, by G. U. Harvey, pres. Queens Boro, Queens Subway Bldg., 500 tons asphaltic cement in tank wagons; 200,000 gal. asphaltic cement in barges alongside; 20,000 cu.yd. steam ashes in 5th Ward; 3,000 bags portland cement.

BITUMINOUS TAR—**Cleveland, O.**—July 24, by Bd. Comrs. Cuyahoga Co., 100,000 gal. bituminous tar material for Road Repair Dpt. $19,000. F. Williams, Court House, engr.

STRUCTURAL STEEL—**Phila., Pa.**—July 21, by C. E. Walsh, purch. agt. Pennsylvania R.R., 15 North 32nd St., structural steel. Contr. 18-1931.

GASOLINE, OIL, etc.—**Austin, Tex.**—July 28, by State Bd. Control, 5 m.g. gasoline, 80,000 gal. kerosene, 197,250 gal. lubricating oils, 215 lb. mineral lubricating greases, 13,000 gal. transmission oils, to State Hy. Dpt. and all other State Departments and Eleemosynary Institutions for 1 year, commencing Sept. 1, 1931.

METAL PIPE, etc.—**Wyoming**—July 20, by State Hy. Dpt., Cheyenne, 2,800 ft. corrugated metal pipe, for Federal Aid Projects 176 G, 205 C and 165 B; 217,450 gal. road oil for Federal Aid Project 115 and State Projects 951 and 883; 274,000 gal. road oil, for State Projects 953, 954 and 915; 27,628 M.B.M. treated timber and 408 lin.ft. treated timber piling for Federal Aid Project 165 B.

CONTRACTS AWARDED

POLES—**Burbank, Calif.**—W. S. Patterson, city mgr., to J. H. Baxter & Co., Central Bldg., Los Angeles, Western Red Cedar transmission poles as follows, twenty 35 ft., $13.65 each; sixty-six 40 ft., $16.25; nine 45 ft., $20.35; eighteen 50 ft., $24.40; sixty poles $32.30, one hundred 11 ft. 10-pin cross arms at $1.35 each; five hundred 8-ft. 2 in. 8-pin $1.15. Noted June 18.

ROAD OIL—**Long Island City, N. Y.**—G. U. Harvey, pres. Queens Boro, Queens Subway Bldg., 75 tons asphalt cement and 200,000 gal. gasoline, to Warner Quinlan Co., 2 Park Ave., New York, $1,157 and $13,240 respectively; 100 tons asphalt cement and 200,000 gal. oil, to Standard Oil Co., 230 Park Ave., New York, $1,296 and $7,840 respectively; 3,000 cu.yd. earth embankment, to Tully & DiNapoli, 30-11 Sherman St., Astoria, $870. Grand total $24,403. Noted June 18.

CONCRETE SLAG, etc.—**Pittsburgh, Pa.**—R. G. Woodside, controller Allegheny Co., crushed slag for asphalt plant and for road maintenance to Duquesne Slag Products Co., Diamond Bank Bldg., $71,200 and $25,255 respectively; asphaltic cement, to Lake Asphalt Petroleum Co., Harrisburg, $150,000; rein.-con., to R. C. Products Co., Engineers Bldg., Cleveland, O. $12,672. Grand total $259,127. Noted June 4.

EQUIPMENT

BIDS ASKED

OIL CIRCUIT BREAKERS — **Los Angeles, Calif.**—July 21, by T. Oughton, city purch. agt., two 37,000 volt outdoor type oil circuit breakers, 600 ampere carrying and 1,000,000 kva. interrupting capacity; 1 tank lowering device for use of above breakers, Spec. 2519.

EXHAUST FAN — **St. Louis, Mo.** — Falco Laundry Co., 3700 Olive St., 36 or 48 in. motor driven 220 d.c. exhaust fan.

SHAPER—**St. Louis, Mo.**—Teuscher Pulley & Belting Co., 801 North 2nd St., heavy duty shaper 16 to 20 in. complete with parts.

GRADER BITS—**Austin, Tex.**—July 27, by State Bd. Control, grader bits, cutting edges to each of the 18 divisions for 1 year, commencing Aug. 1, 1931, bids to be asked for by lineal foot of blade in carload lots delivered at Paris, Fort Worth, Wichita Falls, Amarillo, Lubbock, Balmorhea, San Angelo, Abilene, Waco, Tyler, Lufkin, Houston, Yoakum, Camp Mabry, San Antonio, Corpus Christi, Bryan and Dallas, also on lots of one or more delivered f.o.b. cars at one or more specified shipping points in Texas.

FOREIGN

N. Z., Wellington—Aug. 28, by Secretary Post & Telegraph Dpt., furnishing 500 micro-telephone handles.

Commercial Buildings

RESIDENTIAL

BIDS ASKED

N. J., Asbury Park—C. E. Van Winkle, 501 Grand Ave., bids in October on revised plans 5 story apartment, $500,000. Tillion & Tillion, 48 West 48th St., New York, archts. Noted Nov. 6.

N. M., Albuquerque—J. M. Fidel, taking bids 5 story basement, 90 x 140 ft., rein.-con. hotel, store, 70,000 sq.ft. floor space, plain found. $350,000.

N. Y., Flushing—See "Contracts Awarded."

N. Y., Jamaica—See "Contracts Awarded."

N. Y., Long Island City — See "Contracts Awarded."

CONTRACTS AWARDED

N. J., Englewood—E. M. Coffee, c/o E. DeRosa, archt., 18 East 41st St., New York, apartment, separate contracts in late spring 1932. $400,000.

N. J., Morristown — Newark & Schlosser, c/o J. D. Oben, archt., 85 Harrison Ave., West Orange, general contract 2 story, basement, 75 x 100 ft., brick, steel hotel, store, Morris and King Sts., to Krieger Bros., 92 Schuyler Ave., Newark. Est. $150,000.

N. Y., Flushing—Fow Hill Realty Corp., 26 Court St., Brooklyn, 6 story, basement, 78 x 300 ft. apartment, separate contracts. $360,000. Cohn Bros., 363 Stone Ave., Brooklyn, archt.

N. Y., Jamaica—Art Belt Bungalows, Inc., 160-16 Jamaica Ave., 2 story, basement, 220th St. and Foch Blvd., separate contracts. $150,000. Private plans.

N. Y., Long Island City—Cayne Constr. Co., 3417 34th Ave., 6 story, basement, 90 x 200 ft. apartment, vicinity 42nd St. and Skillman Ave., separate contracts. O. Fischer, c/o owner, archt.

N. Y., Long Island City—Fieldwood Realty Corp., 4126 Queens Blvd., apartment, 47th Ave. and 41st St., separate contracts. $180,000. C. Stidolph, 87-01 51st Ave., Newtown, archt.

N. Y., New York—Port of New York Authority, 80-90 8th Ave., altering Apartment Houses 134, 138, 150 Haven Ave., necessitated by construction of New York approach to George Washington Bridge over Hudson River, to Skolnick Building Corp., 110 West 34th St., $79,630. Noted June 4.

N. Y., Woodside—Thirty-seven to Forty-seven 61st Woodside Corp., c/o I. Crautsman, archt., 275 East Burnside Ave., New York, 6 story, 100 x 127 ft., 61st St. and 37th Ave., separate contracts. $225,000.

Que., Montreal—J. Gregoire, brick, steel, Comte St., to S. A. Normandin, 469 Outremont Ave., $150,000.

CLUBS

PROPOSED WORK

N. J., Asbury Park—Y. W. C. A., E. S. Klausner, pres., 730 Cookman Ave., sketches 1 story, basement, brick, steel, rein.-con. community center, gymnasium. $200,000.

N. J., Freehold—E. H. Schmeider, archt., 3rd Ave., Spring Lake, general contract, bids in September on revised plans, 2 story, basement, brick, steel, club house for Knights of Columbus. $200,000. Noted Mar. 5.

N. Y., Syracuse—Dewitt Development Corp., Thompson Rd., J. S. Brown, pres., stone night club, East Water St. and Erie Blvd. $250,000.

CONTRACTS AWARDED

N. J., Newark—F. H. Koenigsberger, archt., 48 Walnut St., general contract 3 story, basement, brick, steel club, market, Washington and Linden Sts., to Austin Co., 326 Frelinghuysen Ave., for Stephen Holding Corp., 60 Park Pl. Est. $150,000. Noted June 25.

O., Cincinnati—J. C. Grunkemeyer, archt., 3717 Eastern Ave., 2 story, basement, 100 x 200 ft., brick, stucco club house, plain found., to Ferro Concrete Co., 3rd and Elm Sts., for Kenwood Country Club, Madison Rd., $150,000. Noted Sept. 18.

HOSPITALS

PROPOSED WORK

Conn., Willimantic—St. Joseph's Hospital, 88 Jackson St., J. F. Carr, pres. trustees, bids after Aug. 15, general contract hospital. Crow, Lewis & Wick, 200 5th Ave., New York, archts. Noted May 21.

Mass., Belchertown—Commonwealth of Massachusetts, Dpt. Mental Diseases, State House, Boston, sketches by C. P. Hoyt, 8 Beacon St., Boston, brick, steel infirmary, Belchertown State Hospital. $125,000-$150,000.

Mass., Belmont — Commonwealth of Massachusetts, Dpt. Mental Diseases, State House, Boston, sketches by J. H. Ritchie & Associates, 250 Stuart St., Boston, 2 story, basement, brick assembly building and employees dormitory at W. E. Fernald State School. $150,000 or more.

Mass., Norfolk—Commonwealth of Massachusetts, Dpt. Correction, S. Bates, State House, Boston, plans by McLaughlin & Burr, 88 Tremont St., Boston, and takes bids after July 15, brick, steel administration and receiving buildings. $150,000 or more. Noted June 18.

Mo., Springfield—Burge Hospital, H. Pierce, chn. bd., Holland Bldg., plans by Hawkins & Nichols, McDaniel Bldg., 4 story, basement, rein.-con., brick addition, 1323 North Jefferson St. $150,000.

N. J., Hackensack—Hackensack Hospital, 4 story, basement, brick, steel addition. $450,000. **Maturity in February or March.** Crow, Lewis & Wick, 200 5th Ave., New York, archts. Noted Apr. 23.

N. J., Holmdel—Dpt. Institution & Agencies, State Office Bldg., Trenton, institutional buildings, New Jersey State Hospital. $1,350,000. **Maturity probably in Sept.** Dpt. Architecture & Constr., State Office Bldg., Trenton, archts. Noted June 18.

N. J., New Brunswick—St. Peters General Hospital, Easton Ave., will not build 2 story, basement, brick, steel, nurses home. $150,000. Project abandoned. Noted Mar. 25 Daily.

N. J., Plainfield—Columbus General Hospital, 1156 Park Ave., 4 story, basement, brick, steel hospital, plain found., Park Ave. $150,000. **Maturity probably in September.** Noted June 4.

N. J., Skillman—Dpt. Institutions & Agencies, State Office Bldg., Trenton, 2 story, basement, brick, steel dormitories, State Village for Epileptics. $150,000. **Maturity probably in September.** Div. Architecture & Constr. State Office Bldg., Trenton, archts. Noted June 18.

N. J., Weehawken—North Hudson Hospital, Park Ave., will not build 5 story, basement, brick, steel training school, plain found., Columbia Terrace. $350,000. Project abandoned. Noted Mar. 12.

Okla., Norman—Bd. Affairs, Capitol, Oklahoma City, sketches by Layton, Hicks & Forsythe, Braniff Bldg., Oklahoma City, hospital for insane. $150,000.

Okla., Supply—Bd. Affairs, Capitol, Oklahoma City, plans by Layton, Hicks & Forsythe, Braniff Bldg., Oklahoma City, tuberculosis hospital. $150,000. Noted June 19.

Okla., Vinita—Bd. Affairs, Capitol City, plans by Layton, Hicks & Forsythe, Braniff Bldg., Oklahoma City, hospital for insane. $150,000.

Wis., Racine—J. Temme, supt. St. Mary's Hospital, soon lets contract 6 story, basement, 218 x 221 ft., brick, steel, rein.-con. hospital. V. J. Kluthe, 915 Syndicate Trust Bldg., St. Louis, Mo., archt. Noted May 7.

BIDS ASKED

Ill., Chicago—July 27, by Comrs. Cook Co., County Bldg., 17 story basement 162 x 202 ft. nurses home at County Hospital, Polk and Lincoln Sts. $2,350,000.

Ind., Richmond—Aug. 5, by Bd. Comrs. Eastern Indiana Insane Hospital, 2 story, basement, 136 x 218 ft., brick, rein.-con. hospital. $250,000. McGuire & Shook, North Meridian St., Indianapolis, archts. J. N. Ratz, Merchants Bank Bldg., Indianapolis, engr.

Mass., Boston—July 24, by City, Institutions Dpt., 2 story, basement, brick, stone, recreation building, concrete found., at Long Island Hospital $200,000. McLaughlin & Burr, 88 Tremont St., archts. Noted May 14.

N. J., Newark—Bd. City Comrs., City Hall, bids about Aug. 1, 2 story, basement, 300 x 110 ft., brick, steel ward, recreation addition, Ivy Hill Almshouse. $200,000. J. T. Rowland, 45 Walnut St., archt. Noted June 18.

N. Y., New York—July 23, by Dpt. Hospitals, Municipal Bldg., altering and constructing addition for fire prevention to Gouverneur Hospitals, Water St. and Gouverneur Slip.

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Hospitals (Continued)

N. Y., New York—July 29, by Dpt. Hospitals, Municipal Bldg., general contract altering and constructing hospital addition, incl. elevators, dumbwaiters, refrigerators, heating, ventilating, plumbing for Harlem Hospitals, Lenox Ave., West 136th and 137th Sts. Noted June 11.

CONTRACTS AWARDED

Conn., Hartford — State, Cedarcrest Sanatorium, brick, steel infirmary, nurses' home buildings, to Charles Smith & Sons, 101 Water St., Derby. Est. $207,000. Noted June 25.

Conn., Norwich — State, Norwich State Hospital, brick, steel dining hall addition, 2 cottages, to Pieretti Bros., Centerbrook. $49,970. Employees Building already awarded.

CHURCHES

PROPOSED WORK

N. J., Athenia—St. Joseph's Roman Catholic Church, bids about December, general contract 2 story, basement, brick, steel church, school, Spier Ave. $150,000. Waeber & Davidson, 131 East 47th St., New York, archts. Noted Feb. 19.

N. J., East Orange—Central Brick Presbyterian Church, H. E. Nicely, pastor, 113 Woodlawn Ave., bids late in fall church. $150,000. Mayers, Murray & Phillips, 2 West 47th St., New York, archts. Noted Jan. 29.

N. J., Glen Ridge—Guilbert & Betelle, archts., 20 Branford Pl., Newark, bids in September, 2 story, basement, brick, steel church, Sunday school, for Glen Ridge Congregational Church, Ridgewood Ave. $250,000. Noted June 18.

N. J., Jersey City — Monumental Baptist Church, 18 Atlantic St., will not build 3 story, basement, 50 x 100 ft., brick, steel, Atlantic St. $150,000. Project abandoned. Noted Mar. 5.

N. J., Woodridge (br. Rutherford) — First Presbyterian Church, R. H. Hughes, pastor, 430 Highland Ave., will not build 2 story, basement, brick, steel, North Ave. and 3rd St. $150,000. Project abandoned. Noted Mar. 19.

R. I., Warwick—Methodist Episcopal Church, plans by Woodbury & Stuart, 581 Boylston St., Boston, Mass., 1 story, basement, brick, stone, church, Ann and Fair Sts. Est. $25,000. This corrects report in June 25 issue.

BIDS ASKED

Mass., Hyde Park — Most Precious Blood Roman Catholic Church, E. Crowley, pastor, 43 Maple St., taking bids 3 story, basement, irregular sized, brick, stone convent, plain found., Maple St. $150,000. Maginnis & Walsh, Statler Bldg., Boston, archts. Noted Oct. 16.

Mass., Leominster—July 23, by D. R. Baribault, archt., 1562 Main St., Springfield, 2 story, steeple, 110 x 212 ft., brick, granite church, for St. Cecelia's Roman Catholic Parish, J. Chicoine, pastor. $500,000. Noted Nov. 6.

N. J., Passaic—July 17, by St. Peter and Pauls Polish Church, J. Wroblewski, pastor, 126 River Dr., and J. T. Camlet, archt., 26 Piaget Ave., Clifton, general contract 2 story, basement, 50 x 100 ft., brick, steel church, Armory Park. $150,000. Noted July 2.

N. J., Perth Amboy—G. W. Brooks, archts., 216 Smith St., bids about Sept. 15, general contract 2 story, basement, brick, steel convent, plain found., Mechanic St., for St. Mary's Roman Catholic Church, c/o architect. Noted June 18.

CONTRACTS AWARDED

N. Y., New York—Metropolitan Temple, 91 7th Ave., church and Sunday school, 42 7th Ave., to Tidewater Building Co., 101 Park Ave., New York.

Que., Montreal—Roman Catholic Parish of St. Mark, stone, steel church, Beaubien St., to Heroux & Robert, 1414 Crescent St. $300,000.

SCHOOLS

PROPOSED WORK

Conn., Darien—Town School Bd., postponed taking bids general contract until after Oct. 1, school. $150,000. Starrett & Van Vleck, 393 7th Ave., New York, archts. Noted June 25.

Ill., Chicago—Northwestern University, Evanston, Ill., bids about January, general contract music hall. James Gamble Rogers, 154 East 46th St., New York, archt.

Mass., Boston—City Dpt. School Buildings, soon takes bids Edwin P. Seaver School, 2 story, basement, brick, limestone, steel, plain found., Jamaica Plain. $400,000. C. R. Greco, 11 Beacon St., archt.

Mass., Revere — City, A. Cassassa, mayor, brick, steel, high school addition, incl. 14 classrooms, 6 manual training rooms. $500,000. Architect not appointed.

Neb., Lincoln—Bonacum Institute, St. Mary's Cathedral, Inc., at office Diocese of Lincoln, 1408 Sharp Bldg., revised plans by L. A. Daly, 622 Peters Trust Bldg., Omaha, 3 story, basement, 33 x 80 ft. concrete, brick, stone, terra cotta convent, and 3 story, 211 x 218 ft. school. $250,000. Former bids rejected.

N. H., Manchester—St. Augustine's Parish, A. Boivie, pastor, plans by W. E. Provost, 1061 Elm St., 2½ story, 140 x 150 ft., brick school. $150,000.

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N. J., Elizabeth—Bd. Educ., 417 South Broad St., 3 story, basement, brick, steel, rein.-con. school, athletic field, stadium, Clarkson Ave., Green and Garden Sts. $150,000 or more. **Maturity probably soon.** Noted May 7.

N. J., Elizabeth—Bd. Educ., 417 South Broad St., sketches by H. B. Brady, Inc., 333 North Broad St., 3 story, basement, brick, steel, rein.-con. school, athletic field, stadium, Clarkson Ave., Green and Garden Sts. $150,000 or more. Noted July 16.

N. J., Englewood — Englewood School for Boys, 35 Dwight Pl., will not build 2 story, basement, brick, steel school. $150,000. Project abandoned. Noted June 11.

N. J., Fair Lawn—Bd. Educ., Boro Hall, 2 story, basement, brick, steel, Henderson Terrace Sect. $150,000. **Maturity probably in September.** Architect not appointed. Noted June 11.

N. J., Fort Lee—Bd. Educ., High School, for Junior High School, 2 story, basement, brick, steel. $150,000. **Maturity probably in September.** Architect not appointed. Noted June 18.

N. J., Hackensack—Bd. Educ., 355 State St., 2 story, basement, brick, steel, 1st Ward. $150,000. Architect not appointed. Noted June 4.

N. J., Hackensack—Bd. Educ., 355 State St., 2 story, basement, brick, steel, rein.-con., Union St. $150,000. Architect not appointed. Project approved. Noted Jan. 4.

N. J., Hasbrouck Heights — Bd. Educ., Administration Bldg., 2 story, basement, brick, steel addition to Lincoln Grade School. $150,000. Architect not appointed. Noted July 2.

N. J., Hawthorne—Bd. Educ., sketches by Fanning & Shaw, 49 Ward St., Paterson, 2 story, basement, brick, steel high school addition. $150,000.

N. J., Hillside—Bd. Educ., Central Grammar School, Junior High School, 2 story, basement, brick, steel, Chestnut St. and Hillside Ave. $250,000. **Maturity probably in September.** Architect not appointed. Noted June 18.

N. J., Jersey City—Bd. Educ., Administration Bldg., Harrison Ave., 3 story, basement, brick steel, Sherman Ave. $150,000 or more. **Maturity probably soon.** Architect not appointed.

N. J., Jersey City—Holy Rosary Roman Catholic Church, D. F. DiPersia, pastor, 344 6th St., 2 story, basement, brick, steel school. $150,000. Project in abeyance. Architect not appointed. Noted June 25.

N. J., Maywood—Bd. Educ., Municipal Bldg., bids probably in August, 2 story, basement, brick, steel, rein.-con., addition, 1 Maywood Ave. $150,000. G. F. Reeke, 221 Prospect Ave., archt. Noted June 18.

N. J., Newark—Owner, c/o H. J. Weiler, archt., 40 Komorn St., sketches 2 story, basement, brick, steel school, Oliver St. $150,000.

N. J., New Providence—Bd. Educ., School Bldg., 2 story, basement, brick, steel high school. $150,000. **Maturity probably in October.** Architect not appointed. Noted June 18.

N. J., Union—Bd. Educ., 2 story, basement, brick, Stuyvesant Heights. $150,000. Project abandoned. F. A. Elsasser, 1000 Stuyvesant Ave., archt. Noted June 18.

N. Y., Dongan Hills (sta. Staten Island)—Staten Island Academy, 70 Stuyvesant Pl., St. George, sketches by Delano & Aldrich, 126 East 38th St., New York, 2 story, basement, brick, steel school. $150,000.

Ore., Sheridan—Dougan-Reveman, Inc., archts., Portland, bids about September, 3 story, basement college, for Novitiate Society of Jesuites. $400,000.

Alta., Edmonton—Edmonton School Bd., 20 room school $300,000, 10 room school $175,000, 10 room school $150,000, 12 room school $155,000, all stone, concrete, steel.

Que., Montreal—Roman Catholic School Comn., 113 Ste. Catherine St. W., school, Baldwin St., for St. George's Parish. $200,000.

BIDS ASKED

Ark., Jonesboro—July 23 (extended date), by Bd. Trustees Agricultural & Mechanical College, 4 story, brick administration building, $350,000. E. W. Mann, Cotton Exchange Bldg., Memphis, Tenn., and Peter & McAninch, Pyramid Life Bldg., Little Rock, archts. Noted July 9.

Ind., Brookston—July 24, School Comrs., brick, steel school. $150,000. W. G. Rammel, Logansport, archt.

Ind., Millgrove—July 30, by Blackford Co., 2 story, basement, brick, steel school. $150,000. E. I. Brown, 309 1st Natl. Bank Bldg., Fort Wayne, archt. Noted July 9.

Mass., Brighton (sta. Boston)—July 23, by Dpt. School Buildings, 2 story, basement, brick, limestone, steel intermediate school, concrete found., Kendrick St., Bennet Dist. $600,000. Allbright & Blaney, 308 Boylston St., Boston, archts. Noted June 25.

Mich., Flint—July 22, by State Adminstrative Bd., G. R. Thompson budget dir., 2 story, basement, brick steel, stone, concrete school plain found., for Michigan School for Deaf. $150,000. MacKenzie & Pratt, 607 Citizens Bank Bldg., archts. Noted Apr. 30.

Minn., Brainerd—July 28, by Bd. Educ., 2 story, basement, rein.-con., brick, stone school. $260,000. Croft & Boerner, 1004 Marquette Ave., Minneapolis, Minn., archts.

N. H., Durham — July 17, by State, University of New Hampshire, E. M. Lewis, chn., brick, steel infirmary, rest house. $150,000. E. T. Huddleston, Durham, archt. Kilham, Hopkins & Greeley, 9 Park St., Boston, Mass., engrs. Noted June 18.

N. J., Englewood—Bd. Educ., 11 Engle St., bids about Sept. 15, Junior and Senior High School, 2 story, basement, brick, steel, Knickerbocker Rd. $850,000. L. C. Licht, 4 Dean St., archt. Noted June 18.

N. J., New Brunswick — Bd. Educ., High School, Livingston Ave., bids about July 15, general contract altering and constructing 1 and 3 story, basement, brick, steel addition to Senior High School, Livingston Ave., between Delevan and Comstock Sts. $400,000. A. Merchant, 1 Elm Row, archt. Noted July 9.

N. J., Morristown—Bd. Educ., 50 Early St., bids about Aug. 15, general contract 2 story, basement, 40 x 150 ft., brick, steel school addition, Speedwell Ave. $150,000. Campbell & Voorhees, 1 Schuyler Pl., archts. Noted June 25.

N. J., Wilburtha—July 17, by Dpt. Institutions & Agencies, State Office Bldg., Trenton, general contract 2 story, basement, brick, steel training school, gymnasium and swimming pool, State Police Barracks. $150,000. Div. Architecture & Constr., State Office Bldg., archts. Noted July 9 Daily.

N. J., Union—Bd. Educ., bids about Aug. 15, 2 story, basement, brick, steel, rein.-con. school, Oakland Ave. $300,000. F. A. Elasser, 1000 Stuvesant Ave., archt. Noted June 18.

Vt., Bennington—July 20, by Bennington College, R. E. Leigh, New York, pres., 3 dormitories and college building, all brick, stone, Elm St. $1,000,000. J. W. Ames & E. S. Dodge, 148 State St., Boston, Mass., archts. Noted July 9.

Wis., Milwaukee — July 30, by Bd. School Directors, excavation, concrete, steel work for Solomon Junior High School, 3 and 4 story, 200 x 225 ft., brick, steel, Mount Vernon St. $850,000. Van Ryn & DeGelleke, 114 Wisconsin Ave., archts.

CONTRACTS AWARDED

Del., Wilmington—Bd. Educ., 2 story, basement, 143 x 320 ft., brick, rein.-con. school, plain found., to Wm. M. Francis Co., Du Pont Bldg., $409,000. Noted July 2.

Del., Wilmington—Guilbert & Betelle, archts., 20 Branford Pl., Newark, N. J., 2 story, basement, brick, steel, rein.-con. School 25, plain found., to Wm. M. Francis Co., Du Pont Bldg., for Delaware School Foundation, Du Pont Bldg. Noted July 9.

Ill., Evanston—James Gamble Rogers, archt., 154 East 46th St., New York, general contract 2 story, 40 x 200 ft. library, to R. C. Wieboldt Co., 1412 West Washington Blvd., Chicago, for Northwestern University. Est. $1,000,000. Noted Apr. 16.

Kan., Wichita—Bd. Educ., L. Gerteis, secy., 406 York Rite Temple, general contract Charles Robinson School, 3 story, 170 x 228 ft., concrete, steel, brick, stone, to Blaser-Vollmer Constr. Co., Wichita, $156,780; plumbing and heating, to Johnson Plumbing & Heating Co., Wichita, $31,234; electrical wiring, to Shelley Electric Co., Wichita, $7,991. Grand total $196,005. Noted June 25.

Mass., Cambridge—Harvard University, A. L. Lowell, pres., astronomy and dormitory buildings, each 3 story, basement, brick, stone, plain founds., to C. S. Cunningham & Sons Constr. Co., Statler Bldg., Boston, est. $150,000 and $400,000 respectively; heating and ventilating in dormitory, to J. S. Cassedy, 133 Austin St., est. $25,000, plumbing, to T. J. Murphy, 8 Walden St. and electrical work, to Hixon Electric Co., 22 Elkins St., South Boston, est. $25,000. Noted May 21 and June 25 respectively.

Mass., Everett—City, 2 story, basement, brick, stone school, plain found., to Bond Bros., 78 Ferry St., $122,800. Noted May 21.

Mass., Falmouth—Town, P. Dillingham, supt. schools, 2 story, basement, 75 x 120 ft., brick, steel school, to John W. Duff, Inc., 146 Summer St., Boston, $118,000. Est. $175,000. Noted June 25.

Mass., Lawrence—City, Mayors Office, 2 story, basement, brick, stone school, plain found., to Stephen Durso & Sons, 4 Loring St., $89,501. Noted June 25.

Mass., Lawrence—City, Mayor's Office, City Hall, 2 story, basement, brick, stone school, plain found., to Stephen Durso & Sons, Inc., 4 Loring St., 74,520. Noted June 4.

Mass., Lawrence — City, 2 story, basement, brick, stone school, plain found., to Stephen Durso & Sons, Inc., 4 Loring St., $84,497. Noted June 25.

N. J., Bloomfield—Bd. Educ., High School, general contract 2 story, basement, brick, steel, to Schurman Constr. Co., Inc., 86 Lexington Ave., Passaic, $290,000; plumbing, to G. H. Van Variek, 28 Hillman St., Clifton, $20,250; heating, to G. Stewart, 270 South 20th St., Newark, $46,487; electrical work, to Terlizzi Bros., 388 Bloomfield Ave., $28,166. Grand total $384,903. Noted June 4.

N. J., Irvington (br. Newark)—Bd. Educ., 1253 Clinton Ave., general contract altering and constructing 3 story, basement, 35 x 158 ft., brick, steel addition, to Standard Constr. Co., 94 Boylan St., Newark; electrical work, to G. T. Williams, 19 Franklin Terrace. Est. $150,000. Noted June 4.

N. J., Union City—Bd. Educ., 415 32nd St., excavating, grading, demolishing buildings on site for school on West St. between 5th and 6th Sts., to D. J. Malanka, 278 Bergenline Ave., $34,750. Noted June 25.

Schools (Continued)

N. Y., Alfred—Commissioner Dpt. Educ., Education Bldg., Albany, general contract School of Ceramics and service tunnels, to Havens Constr. Co., Olean, $109,900; heating, to Hickey Bros., 256 North Union St., Olean, $17,800; sanitary work, to Van Patton Plumbing & Heating Co., 308 Railroad Ave., Elmira, $6,284; electrical work, to C. W. Gabler Electric Co., 116 South 4th St., Olean, $6,870. Grand total $301,054. Noted May 21.

Tex., Dumas—School Bd. Educ., c/o J. C. Phillips, Dumas, 2 story, part basement, 58 x 214 ft. high school, to Underhill Constr. Co., Eakles Bldg., Amarillo, $124,875; heating and plumbing, to H. G. Person, Amarillo, $19,425. Noted June 11.

Utah, Salt Lake City—State Building Comm., remodeling physical science building at University of Utah, to W. J. Dean & Co., Salt Lake City, $55,000.

Wis., St. Francis—P. Brust, archt., 135 Wells St., Milwaukee, carpentry work for 3 story, basement, 200 x 260 ft. dormitory, for Pio Nono College, to A. Luettger, 338 Deer Pl.; masonry, concrete, to E. Steigerwald & Sons, Inc., 5310 West State St.; heating, to J. S. Jung, 1516 South Layton Ave.; plumbing, to J. Wittig, 1135 North West St. Noted May 7.

THEATRES

PROPOSED WORK

Kan., Wichita—D. Walker, R. Frazier, and A. Noble, Wichita, sketches rein.-con., brick, steel, terra cotta, motion picture theatre, Main and 1st Sts.

N. J., Westfield—Realty Investment Co., R. L. DeCamp, secy., 566 Colonial Ave., 2 story, basement, brick, steel theatre, $150,000. **Maturity probably in September.** Architect not appointed. Noted June 11.

BIDS ASKED

N. J., Red Bank—Boylan & Levin, archts., 143 Albank St., New Brunswick, bids about Aug. 15, general contract 2 story, basement, brick, steel theatre, for Red Bank Amusement Co., c/o archts. $200,000. Noted July 9.

CONTRACTS AWARDED

Calif., Los Angeles—Walter H. Leimert Co., 8107 Vermont Ave., rein.-con., structural steel theatre, plain found., to Lindgren & Swinerton Inc., 225 Bush St., San Francisco. Est. $200,000. Noted May 21.

BANKS

PROPOSED WORK

N. J., Asbury Park—Asbury Park & Ocean Grove Bank, 308 Main St., revised sketches by E. A. Arend, Kinmouth Bldg., 8 story, basement bank, office addition, Main St. and Mathson Ave. $350,000. Noted May 4.

N. J., Newark—S. D'Auria & Sons, 139 7th Ave., will not build 2 story, basement, 50 x 105 ft., brick, steel, bank, Clay and Broad Sts. $150,000. Project abandoned. A. S. Miller, 1774 Carroll St., Brooklyn, N. Y., archt. Noted May 7.

N. J., Red Bank—Merchants Trust Co., 30 Broad St., will not build 6 story, basement, brick, steel bank, store, office, Broad and Monmouth Sts. $500,000. Warren & Wetmore, 16 East 47th St., New York, archts. Noted Mar. 19.

CONTRACTS AWARDED

Pa., Phila.—Sixteen Ten Walnut Corp., 1610 Walnut St., 2 story, basement, 50 x 170 ft., brick, steel, rein.-con., limestone bank, plain found., 1510 Walnut St., to F. V. Warren Co., 15th and Locust St.

OFFICES

PROPOSED WORK

N. J., Jersey City—Journal Square Building, Inc., W. J. Quinn, pres., will not build 10 story, basement, 100 x 100 ft., brick, steel medical office building, Tonnelle and Sip Aves. Project abandoned. Noted Mar. 10, 1930.

STORES

PROPOSED WORK

N. J., Asbury Park—Bd. City Comrs., A. G. King, City Hall, bids in September, 2 story, basement, brick, steel store, bath house, 4th and 5th Aves., adjoining convention hall. $250,000. Warren & Wetmore, 16 East 47th St., New York, archts. Noted June 18.

N. J., East Orange—R. H. Muir & Co., 546 Main St., 40 story, basement, 100 x 100 ft., brick, steel department store, Main and Prospect Sts. $150,000. **Maturity in March or April.** Starret & Van Vleck, 393 7th Ave., New York, archts. Noted Feb. 5.

N. J., Long Branch—Owner, c/o H. B. Seymour, archt., 512 McClellan Ave., 2 story, basement, brick, steel store, apartment, Ocean Ave. $150,000.

N. J., Paterson—Inland Market Corp., P. Algano, in charge, 7 Bank St., 2 story, basement, 30 x 125 ft., brick, steel, store, office, storage, comfort station, Island Market Sect. $150,000. J. Bellomo, 6 Park Ave., archt. Noted July 2.

N. Y., Long Island City—Mission Constr. Co., 16 Court St., Brooklyn, 6 story, 90 x 100 ft. store, apartment, Academy St. and Bway. $225,000. **Maturity soon.** Private plans.

BIDS ASKED

N. J., Union City — W. P. Keane, 317 Monastary Pl., bids about Aug. 15, general contract 2 story, basement, 75 x 100 ft., brick, steel store, office, Bergenline Ave. and 36th St. $150,000. P. A. Vivarttas, 110 48th St., archt. Noted July 9.

CONTRACTS AWARDED

Ill., Chicago—A. S. Alschuler, archt., 28 East Jackson Blvd., 3 story, 100 x 100 ft., top addition, to Avery Brundage Co., 110 South Dearborn St., for L. Rothschild, State St. and Jackson Blvd. Est. $250,000. Noted May 7.

N. J., Caldwell—E. R. Coe, archt., 136 Washington St., Paterson, general contract 2 story, basement, 60 x 125 ft., brick, steel, store, office, to D. Carro Co., 816 South St., Elizabeth, for M. Carter, c/o architect. Noted July 2.

PUBLIC

PROPOSED WORK

Mass., Tewksbury — DORMITORIES — Commonwealth of Massachusetts, J. B. Nichols, supt., plans by Putnam & Cox, 114 State St., Boston, men's dormitory, $70,000; employees building $74,000; superintendent's cottage, $12,000, all brick construction.

N. J., Asbury Park—BATH HOUSE—Bd. City Comrs., City Hall, both houses, stores, near convention hall, $50,000. Project in abeyance until late winter. Warren & Wetmore, 16 East 47th St., New York, archts. Noted Jan. 29.

N. J., Bayonne—FIRE and POLICE ALARM—Bd. City Comrs., City Hall, sketches by L. Quien, Jr., 229 Broad St., Elizabeth, 2 story, basement, brick, steel fire and police alarm building, $150,000.

N. J., East Orange—FIRE HEADQUARTERS—Bd. City Council, City Hall, 2 story, basement, brick, steel, Main St. $160,000. **Maturity probably soon.** Architect not appointed.

N. J., Red Band—LIBRARY—Bd. Boro Council, will not build 1 story, basement, brick, steel library, $150,000. Project abandoned. Noted Apr. 9.

N. J., Wickatunk—INSTITUTION—House of Good Shepherd, 3rd Ave., Newark, bids probably in spring on revised plans 3 story, basement, brick, steel institutional building, $250,000. W. J. Boegel, 185 Madison Ave., archt. Noted Jan. 29.

N. Y., Bedford Hills — REFORMATORY — Commissioner Correction, State Office Bldg., Albany, postponed bids to have been opened July 9, until sometime in August, remodeling 4 buildings at New York State Reformatory for Women. Noted June 25.

N. Y., Brooklyn — FIRE DEPARTMENT SCHOOL—Fire Dpt., Municipal Bldg., New York, fire department training school, $2,000,000. **Maturity about January.** Noted Apr. 23.

N. Y., Long Island City—BORO HALL and COURT HOUSE—G. U. Harvey, pres. Queens Boro, boro hall and court house, $8,000,000. Project in abeyance until fall or winter. A. J. Thomas, 2 West 46th St., New York, archt. Noted Feb. 12.

N. Y., New York—POLICE HEADQUARTERS—Police Dpt., 240 Center St., police headquarters, $8,000,000. T. E. O'Brien, 400 Broome St., archt. Project in abeyance until spring or later. Noted Jan. 8.

N. Y., St. George—BORO HALL—J. A. Lynch, pres. Richmond Boro, Boro Hall, bids in October or later, altering and constructing addition, $575,000. F. Wall, 576 Oakland Ave., West New Brighton, archt. Noted Feb. 26.

Tex., Port Arthur—SUB-COURT HOUSE—Jefferson Co., c/o B. B. Johnson, judge, sketches, rein.-con., steel, plain found., $150,000 bond election Aug. 1 for same. Noted June 4.

BIDS ASKED

Mass., Quincy—CITY HALL, etc.—July 15, by City, 2 story, basement, brick, steel city hall and memorial building, Commonwealth Ave., Walnut and Homer Sts. $1,000,000. Allen & Collens, 75 Newbury St., Boston, archts.

N. J., Caldwell—BORO HALL—Bd. Boro Council, Boro Hall, bids about Sept. 1, 2 story, basement, brick, steel, $175,000. Guilbert & Betelle, 20 Branford Pl., Newark, archts. Noted June 18.

N. J., Jamesburg—INSTITUTIONAL—Dpt. Institutions & Agencies, State Office Bldg., Trenton, taking bids three 2 story, basement, brick, steel, institutional buildings, State Home for Boys, $150,000. Div. Architecture & Constr., State Office Bldg., Trenton, archts. Noted June 25 Daily.

N. J., Jersey City—HALL of RECORDS—Bd. Freeholders Hudson Co., Court House, bids about Sept. 15, Hall of Record Building, 16 story, basement, 200 x 225 ft., brick, steel adjoining court house, $2,000,000. J. T. Reynolds, 30 Veterans Sq., archt. Noted July 2.

Tex., Wellington—COURT HOUSE—July 27, by Berry & Hatch, archts., Eakles Bldg., 3 story, basement, 76 x 110 ft., brick, terra cotta, rein.-con., Square, for Collingsworth Co., E. Brown, judge. $175,000. Noted Apr. 16.

CONTRACTS AWARDED

Mass., Brighton—LIBRARY—City of Boston, Library Dpt., F. W. Buxton, chn. Bd. Trustees, Copley Sq., Boston, 2 story, basement, brick, limestone, granite, steel branch library, plain found., to Boyer Constr. Co., 60 State St., Boston. Est. $200,000. Noted July 9.

R. I., Providence—COURT HOUSE—State County Court House Comm., W. B. Greenough, 30 South Main St., general contract 8 story, brick, stone addition, to J. W. Bishop Co., 1415 Turks Head Bldg., $1,147,630; heating and ventilating, to Lincoln & Lane Co., Pawtucket, $82,500; electrical work, to Scantlevin & Potter, 189 Pine St., $17,978. Grand total $1,248,108. Noted June 11.

UNCLASSIFIED

PROPOSED WORK

N. J., Gladstone — HOME — Villa O'Connor Orphanage, 2 story, basement, orphanage, $150,000. **Maturity in October or later.** DeFoee & Juster, 151 West 46th St., New York, archts. Noted Oct. 16.

BIDS ASKED

O., Cincinnati—NEWSPAPER—July 20, by Sam Hannaford & Sons, archts., Dixie Terminal, 18 story, 2 basements, 125 x 228 ft., limestone, steel, rein.-con., plain found., 8th St. and Bway., for Cincinnati Times Star, 6th and Walnut Sts. $1,800,000.

CONTRACTS AWARDED

Mass., Foxboro—HOME—Doolittle Home, C. Conklin, pres., Bway., altering and constructing 3 story, basement, brick, steel addition to home for aged, plain found., to R. H. Sewell Co., East Central St., Franklin. Est. $150,000. Noted June 25.

Industrial Buildings

FACTORIES AND MILLS

PROPOSED WORK

Ill., Bellewood—FACTORY—Jefferson Electric Co., 15th and Laflin Sts., Chicago, soon lets contract 1 and 2 story, 325 x 650 ft. factory. Olsen & Urbain, 228 North LaSalle St., Chicago, archts. $550,000.

N. J., Glassboro—FACTORY—Peop Orchard-Products Co., plans by L. H. Gaetteiman, Brook Lawn, 3 story, 70 x 130 ft., and 1 story, 75 x 150 ft., brick, steel factory.

N. J., Nutley—FACTORY—Jardine, Murdock & Wright, archts., 347 Madison Ave., New York, soon lets contract 2 and 3 story, basement brick, steel, factory addition, George A. LaMonte & Son, 299 Kingsland Rd. $40,000.

N. J., Paterson—PLANT—Owner, c/o J. C. Van Vlandren, archt., 140 Market St., sketches 2 story, basement, brick, steel industrial plant $40,000.

N. Y., New York—National Screen Serv. Inc., H. Robbins, pres., 126 West 46th St., plans by Berlinger & Kaufman, 232 Madison Ave., 2 story, 98 x 100 ft. plant, office, 346 West 40th St. $250,000.

N. Y., Stanley—FACTORY—Stanley Rug & Drapery Co., L. Cahlen & G. Abraham, Stanley, rebuilding rug and drapery factory, destroyed by fire, $50,000.

Pa., Donora—OIL DISTRIBUTION PLANT—Gulf Refining Co., Frick Annex, Pittsburgh, soon lets contract plant on Monongahela River, near here. $100,000.

Pa., Freedom—OIL PACKING HOUSE—Freedom Oil Wks. Co., E. J. Bischofberger, genl. mgr., plans by J. Martsolf, New Brighton, reconstructing 3 story, 60 x 120 ft. oil packing house, recently destroyed by fire, $100,000.

Pa., New Castle—MANUFACTURING PLANT—Intercontinental Pipe & Mining Co., 122 East 42nd St., New York, A. Hauser, treas., plans plant. **Maturity in fall.** Architect not appointed.

Pa., Palmerton—ZINC SULPHIDE WORKS—N. J. Zinc Co., 160 Front St., New York, plans additions and equipment to zinc sulphide manufacturing plant, $150,000, incl. equipment.

Pa., Pittsburgh—STONE CUTTING PLANT—Pittsburgh Cut Stone Co., 5116 Cypress St., plans by Hunting, Davis & Dunnells, Century Bldg., 1 story, 175 x 200 ft., brick, steel, Preble Ave.

Tex., Harlingen—DRY ICE PLANT—C. W. Parsons, c/o Milan Bldg., San Antonio, 1 story, 90 x 110 ft., brick, concrete, metal-lath plant, $60,000. Private plans.

Tex., Mineola—REFINERY PLANT—Everybody's Independent Refining Co., c/o R. J. Worthington, Mineola, refinery 24 mi. from here, also 4 in. pipe line from Gladewater to here, $150,000. Private plans.

Tex., Pettus—REFINERY PLANT—Houston Oil Co. of Texas, Petroleum Bldg., Houston, and San Antonio, enlarging present refinery plant at Viola.

Tex., Port Arthur—PLANING MILL—Port Arthur Planing Mill, 2 story, 100 x 100 ft. mill, Lake Shore Dr. and Canal St. $50,000. Private plans.

Tex., San Angelo—OIL REFINERY—J. Sanger, purchased plant at Pioneer, near here, and plans installing new equipment. $90,000.

Ont., London—FACTORY—J. Thompson, 201 Victoria Rd., Walkerville, Canadian representative Albert Kahn, Inc., archts., 1004 Marquette Bldg., Detroit, Mich., soon lets contract 3 story, rein.-con., 60 x 80 ft. factory, for Kellogg Co. of Canada Ltd., Dundas St.

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Factories and Mills (Continued)

Ont., Sarnia—OIL PRODUCING EQUIPMENT—Imperial Oil Ltd., C. Lever, ch. engr., expending $1,000,000, new oil producing equipment, in refinery for special processes, cracking coils, stills, etc.

Que., Louisville—PLANT—Associated Textile Co. plant addition.

BIDS ASKED

N. J., Allwood—PLANT—Ballinger & Co., engrs. and archts., 12th and Chestnut Sts., Phila., Pa., bids about July 15, revised plans altering 2 story, basement, brick, steel, for Amer. Colortype Co., 207 West 25th St., New York. $40,000. Former bids rejected. Noted June 25.

N. J., Bloomfield—FACTORY—General Electric Co., Laurence St., taking bids 1 story, basement, brick, steel, addition. $40,000. Private plans.

N. J., Newark — LAUNDRY, etc. — Amer. Realty & Investment Co., c/o New Jersey Toilet & Towel Supply Co., lessee 69 New St., bids about Aug. 1, general contract 2 story, basement, brick, steel laundry plant, garage, Branford and Clifton Sts. $40,000. F. A. Phelps, 21 Fulton St., archt. Noted June 25.

N. Y., Syracuse—SERVICE STATION—International Harvester Co., E. B. Maloney, mgr., 118 Harley Ave., 1 story, 80 x 300 ft. sales and service. $150,000.

Okla., West Tulsa—SALT PLANT—See "Contracts Awarded."

Vt., St. Johnsbury—PUBLISHING PLANT—Caledonian-Record Publishing Co., 107 Eastern Ave., taking bids 1 story, brick, steel, irregular sized, plain found. $40,000. H. H. Owen, 3 North State St., Concord, N. H., archt.

Wash., Wenatchee—PACKING PLANT—See "Contracts Awarded."

CONTRACTS AWARDED

Calif., San Francisco—LAUNDRY—Amalgamated Laundry Co., 385 8th St., 3 story, rein.-con., to Barrett & Hilp, 918 Harrison St., $40,000.

Calif., San Jose—ICE MAKING and REFRIGERATING PLANT—Santa Clara Co., ice making and refrigerating plant in service building at County Hospital, to Carbondale Mchy. Co., 1031 South Broadway, Los Angeles, $11,630.

Conn., Middlefield—COLD STORAGE PLANT—Lyman Farms, J. Lyman, Middlefield, 1 story, 65 x 165 ft., brick, steel, concrete cork insulated storage plant for fruit, to C. F. Wooding Co., Wallace Pl., Wallingford. Est. $40,000. Noted June 25.

Conn., Southington—COLD STORAGE PLANT—Lakeville Farm, H. Rogers, mgr., 1 story, concrete cold storage plant for fruit, to Hayes Constr. Co., 1285 East St., New Britain. Est. $40,000. Noted June 25.

Ill., Carbondale—PLANT—Kroger Grocery & Baking, 7th and Walnut Sts., Cincinnati, O., general contract 1 and 2 story, 250 x 300 ft., rein.-con., brick, grocery distribution plant, to G. K. Ferguson, Hanna Bldg., Cleveland, O. Est. $80,000. Noted Aug. 21.

Mass., Boston — PRINTING PLANT — City, Dpt. P. Buildings, Printing Dpt., 3 story, basement, brick, steel, plain found., to Archdeacon & Sullivan, 1742 Washington St., $246,485. Noted June 25.

Minn., Minneapolis—INDUSTRIAL PLANT—Bd. P. Welfare, general contract 1 story, basement, 130 x 150 ft., rein.-con., brick, at City Workhouse, at Parkers Lake, to E. G. Evensta Co., 2135 California St. N. E. Est. $55,000. Noted Nov. 27.

N. Y., Ossining—STATION—Texas Co., Park Sq. Bldg., Boston, Mass., bulk station, garage, pump house, warehouse, to Closson-Parkhurst Eng. Co., 450 7th Ave., New York. Est. $40,000.

Okla., Sand Springs—COTTON BLEACHING PLANT—Commander Mills, Inc., c/o H. B. Howell, supt., 2 story, basement, 57 x 107 ft., rein.-con., brick, to W. R. Grimshaw, Philcade Bldg., Tulsa, filtration equipment, to Roberts Filter Co., Darby, Pa.; water softner, to Permutit Co., 440 4th Ave., New York; pumps and motors, to Allis-Chalmers Co., West Allis, Wis.; chemical feeders and chlorination equipment, to Wallace & Tiernan Co., Belleville, N. J. Est. $100,000. Noted Feb. 5.

Okla., West Tulsa—SALT PLANT—Texas Salt Products Co., R. L. Drake, vice-pres. and genl. mgr., 135 West 42nd St., New York, concrete, brick, steel, West 35th St. and Sapulpa Rd., local labor. $800,000.

Wash., Wenatchee—PACKING PLANT, etc.—Valley Evaporating Co., G. Hallaun, pres., Yakima, 1 story, 100 x 108 ft., concrete packing and evaporating plant, day labor. $50,000.

GARAGES

PROPOSED WORK

Mass., Lowell—Marden & Murphy, Inc., 15 Kearney Sq., revised plans by Davis & Byam, 420 Hildreth Bldg., 1 story, 100 x 125 ft., brick, repair garage storage, Jackson St. $50,000.

N. H., Manchester—Howard E. Hartman, Inc., 11 Prospect St., revised plans by A. W. Osberg, 795 Elm St., 1 story, basement, 110 x 170 ft., brick, concrete public garage, Elm and West Brook Sts. $50,000. Noted Nov. 13.

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N. Y., Floral Park — J. Kowalsky, Jericho Turnpike, plans by S. Person, c/o owner, 100 x 100 ft. auto service and display rooms, Jamaica Ave. and 257th St. $40,000.

N. Y., Maspeth—I. Fader, 826 Flushing Ave., Brooklyn, sketches by I. Goldstone, 26 Court St., Brooklyn, 1 story, 100 x 100 ft. service garage, 54th St. and Flushing Ave. $40,000.

N. Y., Tompkinsville—Dpt. Sanitation, Municipal Bldg., New York, bids in fall, general contract garage. Noted Jan. 16.

Tenn., Nashville—Martin Garages, Inc., R. E. Martin, pres., plans by Marr & Holman, Stahlman Bldg., 7 story storage garage, 6th Ave.

Que., Quebec City—Quebec Fire Vulcanizing Co., 86 Crown St., garage, St. John and D'Aiguillon Sts. $150,000. Architect not appointed.

BIDS ASKED

N. J., Hackensack—Bergen Auto Co., E. W. Steffens, pres., 17 Banta Pl., 2 story, basement, 100 x 240 ft., brick, steel, rein.-con. auto sales and service building, Main St. and Hackensack Ave. $150,000. Project in abeyance. A. E. Dore, 173 Main St., archt. Noted June 11.

N. Y., Brooklyn—See "Contracts Awarded."

N. Y., South Jamaica (mail Jamaica)—Dpt. Sanitation, W. Schroeder, pres., Municipal Bldg., garage. **Maturity early in winter.** Noted June 16.

CONTRACTS AWARDED

N. Y., Brooklyn—Belfax Building Corp., R. Roth, pres., 26 Court St., 100 x 170 ft., service garage, Grand St., separate contracts, $40,000. M. Klein, 65 Court St., archt. Noted July 9.

POWER PLANTS

PROPOSED WORK

Calif., San Francisco—City and San Francisco Co., power house at Red Mountain Bar in connection with Hetch Hetchy Water System. $1,000,000. M. M. O'Shaughnessy, city engr.

Colo., Grand Junction — Pub. Serv. Co. of Colorado, C. N. Stannard, pres., 15th and Champa Sts., Denver, 2 hydro-electric plants on Gunnison and Colorado Rivers, near here. $600,000.

N. H., Concord — New Hampshire State Hospital, W. A. Stone, purch. agt., State House, plans by R. D. Kimball Co., 6 Beacon St., Boston, Mass., 1 story brick, concrete power plant. $40,000.

Wash., Newport—"Z" Canyon Project, c/o H. L. Cooper, engr., 101 Park Ave., New York, sketches hydro-electric plant, in Columbia River, near here. $4,500,000. **Maturity indefinite.**

La., Shreveport—Southwestern Gas & Electric Co., installing additional power units. $500,000. Sargent & Lundy, 20 North Wacker Dr., Chicago, Ill., mech. engrs.

BIDS ASKED

N. Y., Brooklyn—July 30, by J. M. W. Greeff, comr. Dpt. Hospitals, Municipal Bldg., New York, general contract addition to boiler plant, incl. heating, ventilating, boiler plant equipment, plumbing at Kings County Hospital, Le R. P. Ward, 205 East 42nd St., New York, archt. Noted May 21.

N. D., Fargo—July 25, by State Bd. Administration, E. G. Wanner, secy., Bismarck, heating plant additions, power plant equipment at State Agricultural College, incl. new 400 hp. standing type boiler, traveling gate stoker, handling equipment, 1 smoke stack, 125 ft. high, 5.5 ft. diam. Noted June 18.

CONTRACTS AWARDED

Minn., Litchfield—Village, generating equipment at municipal electric light and power plant, to Donovan Constr. Co., 402 Builders Exch. St. Paul, $55,470.

R. I., Wallum Lake — State, Purchasing Agent, State House, Providence, furnishing, installing boiler at State Sanatorium, to Grinnel Co., Inc., 260 West Exchange St., Providence, $5,484; brick setting, to Charles McComish Co., 36 Exchange St., Providence, $1,523; hand stoker, to Perfection Grate & Stoker Co., 4 Fisk Ave., Springfield, Mass., $678. Grand total $7,685. Noted May 14.

Que., Lachine—Jenkins Bros. Ltd., 617 St. Remi St., Montreal, power house and iron and brass foundry, George Fifth Ave., to A. F. Byers & Co., Ltd., 1226 University St., Montreal, $375,000.

Sask., Regina—Canadian Pacific R.R., J. M. R. Fairbairn, ch. engr., Montreal, Que., power house, to Bird, Woodhall & Simpson Ltd., Regina, $80,000.

WAREHOUSES

PROPOSED WORK

Ala., Mobile—Alabama Dock Comn., units of warehouses as needed.

Conn., New Britain—Hardware City Storage Co., 242 Main St., plans by Kingsley Serv. Co., 103 West 125th St., New York, 6 story, basement, 50 x 100 ft., brick, steel storage warehouse.

N. J., North Bergen — Owner, c/o C. G. Eichlotz, Inc., archts., 960 Bergenline Ave., Union City, sketches 4 story, basement, brick, steel warehouse and showroom addition, Hudson Blvd. $50,000.

N. Y., Brooklyn—H. M. Hillman lets general contract about July 15, altering storage building, Flatbush Ave. extension and Myrtle Ave. E. Owre, 53 Fort Hill Circle, St. George, archt.

N. Y., New York—Grand Allen Holding Corp., 16 Court St., Brooklyn, plans by A. Farber, 16 Court St., Brooklyn, furniture storage, showroom alterations, 314 Grand St. $50,000.

O., Cleveland—New York Central R.R., R. O. Rote, ch. engr. (lines west of Buffalo) West 3rd St. and St. Clair Ave., plans by G. Herr, c/o owner, 1 story, 80 x 170 ft., brick, stone, steel engine house addition, Collingwood Yards. $60,000.

CONTRACTS AWARDED

N. Y., Willard—Dpt. Mental Hygiene, State Office Bldg., Albany, refrigeration park, enlarging cold storage and ice making plants, Willard State Hospital, to Carbondale Co., 175 Christopher St., New York, $13,087. Noted May 28.

BUSINESS NOTES

The news items under this heading are obtained from various sources and where possible have been verified. The unverified items are obtained chiefly from press dispatches and are published at once for their timeliness.

The Navy Department has asked for bids for ten destroyers to cost between $4,000,000 and $5,000,000 each.

St. Louis has 2,500 gas lamps and 4,500 naphtha lamps. According to J. C. Pritchard, director of public utilities, $217,000 can be saved yearly by completing electrification at a cost of $3,000,000. Annual unit costs are: gas lamps, $30; naphtha, $72; electric, $26.

Delaware Valley Utilities Company has purchased from National Water Works Corporation 24 water companies operating in five states, having an appraised value of $11,000,000.

Vehicular tunnel under the St. Clair River, between Sarina, Ont., and Port Huron, Mich., estimated to cost $8,000,000 is projected in a bill reviewed July 7 by the Parliamentary Committee on Railways and Canals, Ottawa.

Road improvement program in Lorain County, Ohio, for 1932 is estimated at $1,024,000. State Highway Department to furnish $600,000, County $244,000 and various railroads to aid in grade elimination projects $180,000.

A $10,000,000 bond issue for roads and bridges passed the Tennessee Senate July 1.

The California Water Service Co. plans to acquire the San Carlos, Los Altos and Pacific Water companies were disclosed with the filing of an application with the State Railroad Commission to issue securities. The proceeds together with the $1,685,000 received from sale of properties to City of Fresno will pay for the expansion.

The Westinghouse Airbrake Co. has received an order from the Pennsylvania Railroad Company for equipment, cost to exceed $1,000,000.

The Westinghouse Electric & Manufacturing Co. was awarded a contract by the Navy department for new main propelling machinery for three battleships, to cost $1,395,000.

The Continental Television Corp., Joseph Leopold, president, has been incorporated to manufacture and assemble television equipment in Newark, N. J. Capitalization will consist of 600,000 shares no par capital stock and will have no preferred stock of bonded indebtedness. The company has acquired control in Radio Technic Laboratory.

Development of an oil industry in Germany at an estimated expenditure of about $7,500,000 over the next twelve months was announced by William S. Thomas, president of the Magdalena Syndicate, acting in conjunction with other Eastern capitalists. Through the transaction the Americans gain control of the only producing, refining and distributing group operating in Germany at present. The Syndicate is concluding arrangements for the erection of a modern refinery by a leading American company.

See proposal advertising on page 77